



Central Washington Animal Agriculture Team

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An Overview of Calf Scours

Dr. Susan R. Kerr, DVM, PhD
WSU Klickitat County Extension Director

Scours (calfhood diarrhea) can be caused by viruses, bacteria, parasites, toxins, congenital problems or various nutritional reasons. Many scour-causing agents are contagious, so scours is often a concern for the whole calf crop. Some of these disease agents can also threaten the health of other species on the farm or ranch, including humans.

Why is scours such a concern for cattle producers? In addition to the direct costs involved (labor, medications, laboratory fees, lost calves), significant indirect costs can occur throughout the animal's life, including subsequent pneumonia and poor performance. Death is another scours-related outcome; it is usually due to the dehydration, shock and/or acidosis caused by severe loss of fluid, bicarbonate and electrolytes in diarrhea.

Scours can be caused by any factor that increases secretion of fluid into the bowel and/or decreases absorption of fluid from the bowel. In the case of contagious agents, whether or not a calf develops scours depends on the dose of pathogen ingested as well as the calf's overall health and immune status. Generally, immunity increases with the calf's age and history of colostrum intake but decreases with stress.

Bacteria Causes

The major bacterial causes of scours include *Escherichia coli*, *Salmonella*, *Clostridium*, *Campylobacter*, *Shigella* and *Yersinia enterocolitica*. New animals can bring these bacteria into a herd, or a herd may already contain chronic carriers that periodically shed the bacteria in their feces and infect other animals. Classic carriers include animals purchased at sale yards and "poor doing" animals that are held back and grouped with younger animals.

Escherichia coli is the most common cause of scours, particularly in calves between one and ten days old. Although *E. coli* is a normal resident of the intestines, disease-causing variants produce potent toxins that can cause diarrhea, dehydration, shock and death, especially in very young calves. As with many other types of scours, the younger the calf, the more likely it is to die from *E. coli* or its complications. There are many different strains of *E. coli*; some cause diarrhea by releasing toxins and others directly damage the intestinal lining. Some calves may die before they develop scours. Although good sanitation practices will help control some outbreaks of *E. coli*, a very potent strain can cause a severe scours outbreak. Laboratory tests, particularly culturing the organism from the intestines and other organs at necropsy, can help diagnose this disease.

A vaccine against *E. coli* scours is available and can be given to cows about a month before calving; the calf will be protected as long as it ingests the cow's colostrum soon after birth. In the event of an outbreak of *E. coli* scours, some cows may be too close to calving to build up immunity to the vaccine before their calf is born. In these cases, commercially available monoclonal antibodies can be given orally to a newborn calf immediately after birth. Both the vaccine and the oral monoclonal antibodies should include the K-99 antigen.

Salmonella species often cause severe diarrhea in calves; many cases are fatal. Affected animals often have a fever, strain to defecate and lack a good appetite. The diarrhea may be bloody, watery, mucousy, foul smelling and may contain shreds of gut lining. Affected calves are typically between 2 and 12 weeks old, but any age may be affected, including adults. Some animals are

chronic carriers of Salmonella and shed the bacteria periodically in their feces--especially after being stressed by calving, shipping, handling, etc. Infection is by the fecal-oral route. Birds and rodents can help spread Salmonella around, and warm, wet pasture can remain contaminated for extended periods. Floodwaters are often heavily contaminated with Salmonella, as is the land and plant matter that is flooded. Some farms and ranches have periodic severe outbreaks of diarrhea in calves due to Salmonella.

Diagnosis of Salmonellosis is by fecal culture. An antibiotic sensitivity test should be performed at the same time to see if the strain involved is susceptible to certain antibiotics; this information can help your veterinarian decide whether or not to recommend antibiotic therapy. Treatment can include fluid and electrolyte replacement, administration of probiotics, warmth, and careful use of nonsteroidal anti-inflammatory agents for their anti-toxin properties. Unless laboratory work has been performed to diagnose Salmonellosis and determine antibiotic sensitivity, oral antibiotics should NOT be used -- they will kill the beneficial intestinal bacteria that compete with Salmonella organisms and help slow down their multiplication. In very young animals, Salmonella can cross the intestinal tract and enter the blood stream, causing septicemia; these calves usually die within one or two days.

Several strains of another bacteria called Clostridium perfringens produce potent toxins that can cause a severe diarrheal disease known as enterotoxemia. Types A, B, C, D and/or E may be involved. Affected calves may appear ill suddenly, especially after a change in cows' feed or change in the weather. Another predisposing factor is handling or any other practice that keeps calves away from their dams for a long period of time; when the pairs are re-united, the calves may consume too much milk all at once. This excess milk in the intestinal tract is an excellent growth media for Clostridium, which proliferates and produces its toxins. Some calves may die before they develop diarrhea; others develop colic, become depressed, and may bloat. On autopsy, the intestines may look purple and contain hemorrhages. Laboratory tests can identify the toxin involved. Again, a vaccine is available to help prevent scours due to this agent. An anti-toxin is available and can be used to save calves during an outbreak of enterotoxemia.

Campylobacter jejuni can cause a mild to moderate diarrhea that is often thick and contains

mucous and/or blood. This agent is spread through the fecal-oral route, often via contaminated water, food, or milk. Contamination can be spread by birds, rodents, flies, feet, buckets, shovels, tires, and so on. Diagnosis of Campylobacteriosis is through blood work to test for antibodies or by fecal stain or culture. Treatment with antibiotics should be based on the results of sensitivity testing performed in a laboratory.

Viral Causes

The three main viral causes of scours are Rotavirus, Coronavirus and Bovine Viral Diarrhea (BVD). They can cause severe diarrhea themselves or in concert with secondary bacterial invaders such as those already mentioned.

Rotavirus usually affects calves less than two weeks old, but can be a problem beyond this age, especially the first time it hits a herd. It can be seen in calves as young as one day old. Calves are often quite depressed, lose their appetite and have very watery feces; feces may be discolored yellowish-green. Many cases of Rotavirus are fatal, and the fatality rate increases with decreasing age. Diagnosis is by fecal examination under an electron microscope. This type of scours can be prevented by vaccinating pregnant cows about a month before they calve and then ensuring colostrum intake, or by vaccinating calves orally at birth.

Another important scours-causing virus is Coronavirus. Coronaviral scours usually occurs a little later in a calf's life than does Rotaviral scours -- it is usually seen in calves five days to six weeks old, and most often in calves 3 weeks old or less. Affected calves are less ill than with Rotavirus and a fewer proportion die. Feces often contain mucous and calves may also show signs of respiratory illness. Diagnosis is again by electron microscopy and also blood tests. Adults in the herd may be subclinical carriers. Coronaviral scours prevention is similar to the control of Rotavirus mentioned above. A combination vaccine against Coronavirus, Rotavirus and E. coli is effective and commercially available.

Bovine Viral Diarrhea (BVD) is an extremely complicated disease that can manifest itself in a variety of ways in a herd. Depending on an animal's immune status, vaccination history, type of virus involved and other factors, signs of BVD can range from chronic poor-doers to malformed calves to a herd outbreak of severe

bloody diarrhea and death. During an actual outbreak, affected animals usually have ulcers on their tongues and oral tissues, high fevers and may pass blood clots instead of feces. A variety of BVD vaccinations are available. The type of vaccine used and the timing of vaccination is crucial; BVD outbreaks have occurred despite a herd history of vaccination. Work with your veterinarian to develop a vaccination schedule that is best for your herd.

Parasitic Causes

Coccidiosis is a common cause of calfhood diarrhea, especially in calves from one to three months of age and/or those just weaned. It is caused by protozoal organisms including *Isospora*, *Eimeria* and other species. It is spread through the fecal-oral route and is easily diagnosed by a fecal exam. The diarrhea may be bloody. Affected calves can have a rough coat, pot belly, poor body condition, and permanently stunted growth. Their defenses are weakened and they can easily contract other diseases; some can die. Clinical coccidiosis can be prevented or minimized by feeding one of the commercially-available coccidiostats in the creep feed or mineral mix. Clinical coccidiosis is a young animal's problem -- older animals seem to develop immunity to this protozoa, and the disease is rare in animals older than one year. Animals with diarrhea due to coccidiosis need to be treated with special medications such as Corid®, Amprolium® or special sulfa formulations; other common wormers (even Ivermectin® or Valbezen®) will not kill this parasite. Scouring animals should be drenched or treated through their water supply. If one animal in a group of young animals is scouring because of coccidia, it is best to treat the whole group. Also, once an animal has been diagnosed with coccidia, consider the premises contaminated for good. About the only good news with coccidia is that it is species-specific; that is, chickens can not spread their coccidiosis to calves and so on.

Cryptosporidium parvum, another protozoal organism, is similar to coccidia and can cause severe diarrhea. It is not species specific, is contagious to humans, affects all ages of animals, is extremely resistant to disinfectants, cannot be prevented with coccidiostats, and is not affected by most medications. It can be diagnosed through a fecal examination. Treatment consists of supportive therapy such as fluids, electrolytes and warmth. Many animals die

from this disease; those that survive have short-lasting immunity. This is one of the very bad bugs you can bring home from the sale yard. The typical carrier: a dairy calf that a beef producer buys to graft on to a beef cow that lost her calf.

Neospora caninum is yet another protozoan parasite that can cause diarrhea in calves. It is more widely known as an abortion-causing agent. Dogs and their relatives are the true host of this parasite; they shed *Neospora* eggs in their feces and can contaminate cattle feed and forage. The organism can be spread from the cow to calf across the uterus or through colostrum and milk. Diagnosis is made through blood work or tissue analysis.

Two other parasitic diseases that can cause diarrhea are *Giardia lamblia* ("beaver fever") and Ostertagia. The former is a protozoa found in fresh water. Once ingested, it can cause abdominal cramps and diarrhea in all mammalian species. Special anti-protozoal medication is needed to treat this disease, and this organism can be spread from animals to people. Heavy infestations of the intestinal worm *Ostertagia* can cause diarrhea, typically in calves over 7 months old. It is easily treated by common intestinal dewormers, and can be controlled by routine worming and good sanitation/manure management practices.

Miscellaneous Causes

Overeating of milk, grain, fruit, or any other carbohydrate-rich substance can cause diarrhea in individual animals of any age. As mentioned, intestinal bacteria can cause fermentation of intestinal contents and the subsequent osmotic pressure draws fluid into the bowel; severe diarrhea can result. Non-specific treatment of these nutritional causes of scours includes removal or discontinuation of the causative substance, feeding a bland diet such as grass hay or straw, giving electrolytes if dehydration becomes severe, and administering medications such as Pepto-Bismol® that normalize intestinal contraction rates. Oral antibiotics are rarely indicated, recommended or necessary.

"White milk scours" or nutritional scours is a syndrome sometimes seen when calves and cows are re-united after being separated for several hours. Examples of this scenario include sorting, pregnancy checking, vaccinating, or when a pair becomes separated on the range. After the pairs are reunited, the hungry calves nurse heavily; the consumption of a large meal of milk

overwhelms the capacity of the calf's stomach and undigested milk passes directly through the intestinal tract and causes white scours. Affected animals usually have no signs of illness and nutritional scours resolves itself within a day or two. Some animals may show mild colic, stop nursing and become depressed. Treatment with electrolytes and Pepto-Bismol® as mentioned above should suffice.

A few other minor causes of scours include various poisonous plants (elderberry, azalea, etc.), arsenic poisoning, Astrovirus infection, Enteroviruses, cobalt deficiency, zinc deficiency, selenium deficiency, copper deficiency, molybdenum toxicity, mycotoxins, organophosphate poisoning, water toxicity, water deficiency, Chlamydia, *Clostridium haemolyticum* ("red water disease" or bacillary hemoglobinuria) *Shigella*, and *Yersinia enterocolitica*.

Treatment

Treating scouring beef calves is a challenge. The BEST treatment -- though far from practical -- is to take the calf off milk, i.e. remove it from the cow. The reason for this practice is to rest the calf's intestinal tract. Whenever it is inflamed, infected or irritated, the bowel temporarily loses its ability to produce lactase. Lactase is the enzyme needed to digest lactose (milk sugar). Without lactase to digest it, lactose remains undigested in the bowel and is fermented by bacteria. The products of fermentation make the bowel's contractions speed up and draw water into the bowel, causing diarrhea. Also, milk contains lots of substances that pathogenic bacteria love to feed on. These facts explain why milk is the worst thing to feed to a scouring calf.

Scouring calves lose primarily water, bicarbonate, sodium and potassium in their feces, so treatment should focus on replacing these critical elements. Numerous electrolyte powders are available commercially and these should be kept on hand during calving season. In a pinch, this homemade scours treatment can be used: one tablespoon baking soda, one teaspoon salt, eight ounces of 50% dextrose OR 8 ounces of light Karo syrup, and enough warm water to total one gallon of fluid. Scouring calves should receive about one quart of an electrolyte solution every 3-4 hours, depending on the severity of diarrhea and dehydration. If they are alert but won't nurse, careful use of an esophageal tube feeder may be needed.

Severely dehydrated and depressed calves may need sterile intravenous, subcutaneous or intraperitoneal fluids to survive. Electrolyte solutions can be given to young calves as their sole nutrition source for a maximum of 48 hours; beyond this period, calves grow weak due to the lack of energy in electrolyte solutions. Calves are born with hardly any energy reserves, so they can not survive very long without an energy source such as lactose. To transition the calf back on milk, bottle feed one quart of cow's milk or milk replacer, or let the calf back onto its dam briefly. If scours continues, the next meal should be about 3 or 4 hours later and consist of the electrolyte solution again. Alternate meals -- electrolytes, milk, electrolytes, milk, etc. -- until the calf no longer scours and is able to be on the mother full-time. Never dilute milk with electrolytes or water and feed this diluted mixture when trying to get calves back on milk. The rennin in the calf's stomach will not be able to clot the casein in the diluted milk, and clotting is a necessary step in the milk digestion process.

Antibiotics or no antibiotics, that is the question. Some producers swear by the effectiveness of certain oral antibiotics to treat scours and it's hard to criticize what works. However, antibiotics should ALWAYS be used with caution and only when indicated; injudicious use of antibiotics (especially oral antibiotics) eliminates the beneficial intestinal bacteria that keep pathogenic bacterial numbers in check through direct competition within the gut. And let's face it—most oral antibiotic treatments for scours are pretty mild and have been around a long, long time; most of the disease-causing bacteria have probably developed resistance and just laugh at them anymore. Giving probiotic preparations (dried, commercially-available "good" intestinal bacteria) to a scouring calf makes much more sense than giving oral antibiotics. For Salmonellosis, bacterial culture and sensitivity testing must be used to select the correct antibiotic.

Sick calves should be isolated from the rest of the herd, and healthy animals should be tended to first. Change boots and clothes, wash your hands and disinfect equipment after treating a sick calf. Keep good records that note which animals were ill, who their dams were, what vaccinations the dams received, what treatments were administered and which treatments were effective.

A quick word on milk replacers: make sure you use commercial products that are primarily milk protein, not soy or fish protein. Neonates cannot digest soy or fish-based protein yet. Also, make sure the product contains at least 20% fat or the calves will not have adequate caloric intake; this is particularly important during cold weather. Many milk replacers contain antibiotics, but for the reasons already mentioned, routine feeding of oral antibiotics should be avoided.

Zoonotic Concerns

Several scours-causing agents can be transmitted to humans; bear this in mind when you come in contact with scouring calves. The organisms of special concern include *E. coli*, *Salmonella*, *Yersinia enterocolitica*, *Cryptosporidium parvum*, *Giardia lamblia*, and perhaps *Campylobacter*. Make sure you wash your hands well after handling scouring animals. Wear protective clothing and disinfect all foot gear, clothing and equipment used to treat sick calves. Put special emphasis on disinfecting milk bottles, nipples and pill guns. A 1:10 solution of bleach is an effective and practical disinfectant, but surfaces must already be soap-and-water clean. Let the 10% bleach solution contact the surface to be disinfected for at least 10 minutes; 30 minutes of contact are needed to kill some types of pathogens. Unfortunately, *Cryptosporidium* is resistant to disinfectants and most other practical forms of sanitation.

Prevention

Preventing scours is most effective when the cause of scours has been identified. Through fecal, blood and tissue cultures and more complicated procedures, it is often possible to determine the cause of an outbreak. Work with your veterinarian to collect and submit samples properly.

Is it possible to eliminate scours? Probably not, but many simple and practical management practices can reduce the number and severity of outbreaks in your herd. First of all, consider what time of year calves are born. Typically, calves born in January and February have many more cases of scours than do calves born in April or May, and the cases are more severe. The stress of cold and wet weather probably contributes to this difference. Calves born in winter are often chilled and can be slow to get up and nurse. Colostrum intake immediately after birth is essential for calf survival. Not only

are chilled calves weaker and less likely to ingest adequate amounts colostrum quickly, chilled neonates are not able to absorb colostrum antibodies across their intestinal lining. Also, animals born during inclement weather are often put inside a shelter, where pathogenic organisms accumulate. You have to balance various factors to decide when to calve: earlier calves will have higher weaning weights but greater losses due to scours or pneumonia.

Secondly, thoroughly sanitize all equipment that you use on animals. This includes balling guns, OB chains, buckets, milk pails, milk bottles, needles and so on. A 10% bleach solution is an excellent disinfectant, but dirt or feces deactivate bleach, so the surface must be cleaned thoroughly with soap and water first. Numerous commercial disinfectants are available through veterinarians, farm supply stores and catalogs. Remember to follow all instructions on the label carefully, including those that pertain to dilution and disposal.

Another crucial prevention measure: DO NOT BRING ANIMALS HOME FROM SALE YARDS. All too often you will also bring home *Salmonella*, *E. coli*, or *Cryptosporidium parvum*. Try to keep a closed herd. If you do bring animals in, isolate them for one to three months before introducing them to the rest of your herd. The isolation area should be down wind and down stream from the main herd. It should be thoroughly disinfected or at least cleaned, exposed to the sun, limed and heavily re-bedded between uses. Steam jennies use heat and pressure to clean hard surfaces very well.

To help prevent an outbreak of Salmonellosis in your herd, avoid purchasing animals that may be carrying the disease, such as animals from sale barns, stunted animals and chronic poor do-ers. If you do purchase animals, isolate them for at least one month in an area away from the rest of your herd and observe them for signs of illness. Purchase clean and uncontaminated feed, feed above the ground and keep water supplies free from manure. A test-and-cull program can be repeated in a problem herd until all carriers have been identified and removed. A vaccine is available and may be recommended for herds with a history of this disease. Minimize stress by feeding well, providing adequate shelter, preventing over crowding, worming, and handling animals humanely and rarely. Also, do not change feed types or amounts rapidly and do not restrict feed -

- these practices can cause fluctuations in types and numbers of gut flora and allow Salmonella to proliferate. Finally, do not hold back chronic poor do-ers. These animals are often silent carriers of Salmonella and holding them back allows the organism to be transmitted between groups of cattle. Chronic poor do-ers should be culled.

Vaccines also can be used to prevent and/or control rotavirus, coronavirus, E. coli, BVD and Clostridium diarrhea. The first time a vaccine is given to a particular bred cow or heifer, it usually has to be given twice: once 6-8 weeks before calving and then again 2-3 weeks before calving. An annual booster is needed 2-3 weeks before calving. In some circumstances, your veterinarian may advise a different schedule, such as Clostridial vaccines every six months.

Coccidiostats help control and prevent coccidiosis. They also help boost calves' rates of gain so are worth the money and effort to use them. Several types are available; some are feed additives and are fed continuously and others are added to the water and administered for 21 days during the period of highest expected incidence.

Other general recommendations to help prevent scours include ensuring excellent sanitation; practicing effective manure management and removal; minimizing animal stress (such as by using wind breaks, minimizing handling, etc.); supplementing with Selenium; culling animals that do not respond to treatment; worming when indicated; preventing overcrowding (especially in the calving area); providing good nutrition; rotating winter feeding sites; and making any ration changes gradually. Work with your veterinarian to design specific prevention and control programs for your herd.

Many parts of the U.S. are deficient in Selenium. This important mineral is an essential part of enzyme systems and also contributes to the proper functioning of an animal's immune system. Some ranchers have reported great strides in scours control after instituting a selenium supplementation program. Selenium can be administered by injection to cows during late pregnancy, included in mineral and salt mixes and/or injected into neonates. Refer to WSU Extension publications EB1607 and PNW0157 or your veterinarian for more information on this topic.

Because dogs are the natural definitive host for Neospora caninum, control programs should start with preventing access by dogs to infectious material such as dead calves, aborted fetuses, stillborn calves, and fetal membranes. Protect cattle feed and water from contamination by dog feces, too.

The importance of calves receiving sufficient amounts of high-quality colostrum immediately after birth cannot be overemphasized. Calves should ingest a minimum of 10% of their body weight in colostrum within the first 24 hours of life. When in doubt, tube feed. If you have a tractable cow that has plenty of colostrum, milk out a few quarts and freeze it. It will be good for up to a year. Always thaw frozen colostrum in a warm water bath, not a microwave. Other less preferable sources are pasteurized colostrum from a cow in another herd or commercial colostrum supplements. Ensuring adequate colostrum intake by every calf is probably the single most important step producers can take to lessen the severity and frequency of scours in their herds.

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