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PHOTO BY KATIE COOPER

Fighting Cold Stress in Calves

Increase survival rates and prepare calves for healthier and more productive futures by identifying and assisting chilled calves at birth.

by *Heather Smith Thomas*

The temperatures are well below zero. The ground is frozen, hard and covered with snow. Winds howl through gray-colored skies. All too often, this scene is the welcoming mat for calves born during the winter months. These conditions are the perfect recipe for calves to become chilled, which can quickly become a life-threatening situation for a newborn calf.

Calves that become too chilled at birth — because they are not sufficiently warm and dry or have not ingested colostrum in a timely manner — have poor survival rates. If a calf becomes chilled before attempting to suckle, it may be unable to get the teat in its mouth. If the calf fails to nurse, it does not obtain the energy necessary to keep warm or the antibodies needed to protect against disease. As the calf becomes colder, its ability to absorb antibodies from colostrum diminishes.

The longer a calf is chilled, the more problems compound against its survival rate. As a result, timely identification of chilled calves is important. Once these at-risk calves are identified, action must be taken to warm them and to supply colostrum. Prevention is also key to negating risk for chilled calves.

Identifying at-risk calves

Determining whether or not a calf is chilled can prove difficult. Some ranchers stick their fingers in a calf's mouth to determine how cold it is, but Russ Daly, Extension veterinarian at South Dakota State University, recommends taking the calf's rectal temperature with a thermometer.

"It's those borderline calves that may be hard to determine," says Daly, DVM, DACVPM. "Any calf whose rectal temperature is below 100 degrees could benefit from being warmed or having a supplemental dose of colostrum."

High-risk calves — those who fail to get up right away or roll onto their chest immediately after birth — need to be identified quickly.

"Studies in Scotland analyzed how long it takes a newborn calf to raise its head and rise onto its chest," says John Campbell, DVM, head of the Large Animal Clinical Sciences Department at the Western College of Veterinary Medicine, a part of the University of Saskatchewan. "That interval between birth and rising onto the chest is a good indicator of calf vigor.

"If a calf takes more than a few minutes to become upright, it may be low on oxygen due to problems during birth, and is much more likely to suffer cold stress," he continues. "You need to identify these individuals quickly. Early intervention can make sure these calves do not end up being hypothermic."

Hypothermia

During the first two to three hours of life, calves are unable to regulate body temperature, and even a normal calf can become hypothermic quickly in cold weather.

"Chilled calves are unable to get up, unable to suckle, so they don't get colostrum — and this compounds the problem. Even if they survive, they are likely to get sick later," Campbell says.

Most problems with hypothermia occur in newborn calves, which do not have as much ability to regulate body temperature. In addition, these calves are wet and more readily chilled.

"The hair coat is remarkably insulating, once it is dry. It is much harder to chill a dry calf," Campbell explains. "But this insulating coat can be a disadvantage if the calf is already chilled. It can keep the calf cold, as well as warm. If the calf is cold, dry hair may actually thwart your efforts to warm it."

Even a normal calf can become hypothermic quickly if weather is severe. In warm weather, pairs can be allowed more time to bond and initiate nursing, but Campbell recommends intervening sooner rather than later in cold conditions.

"You must be more vigilant and intervene sooner if you're not sure whether the calf has nursed," Campbell says. "A thermometer can help assess a calf and know if you can use a hot box or go through the effort of a warm water bath."

Warming a calf

After identifying a chilled calf, action must be taken to warm the calf. Many options exist for warming chilled calves, including warming boxes and commercial boxes.

"[Commercial boxes] may be more expensive, but most of them are made from a poly type of plastic, which is easy to clean," Daly explains. "Warming boxes made of wood work well to insulate calves, but are much harder to completely clean. Boxes should be cleaned and disinfected between calves, and wood is more difficult to sanitize."

Bacteria grow in warmth and humidity. Lack of sanitation in warming boxes increases the risk for calf scours. By paying attention to materials and design, farmers can make sure their boxes can be cleaned easily and thoroughly. Good ventilation and a way to remove humidity are necessities as well.

"If [the box] is too humid, you'll have more problems with respiratory diseases as well as a buildup of pathogens," Daly says.

Young calves are also susceptible to frostbite, which can often be reversed with warm water. If the calf has not been cold too long, utilizing warm water — not hot — helps warm the damaged tissues.

"Don't rub [the affected area] very much. Those tissues may be damaged from freezing and rubbing could damage them worse," he says.

Extremities, like ears and tails, are first to freeze. Frozen feet are a more critical issue. Most calves with frozen feet are debilitated from another condition, like scours. In this instance, the dehydrated calf has less blood flow to its extremities. Limbs become cold and more vulnerable to freezing.

If a calf is sick, it is usually spending too much time lying down and may not be able to get up, move and get circulation

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going. Blood perfusion to the limbs is severely compromised, and reduced perfusion can cause feet to freeze at temperatures that would not be dangerous to a normal, healthy calf.

"If the calf's temperature is between 95 and 100, this is borderline hypothermia," Campbell says. "If his temperature is less than 95 degrees, you've got to quickly warm him. For calves with temperatures between 95 and 100 degrees, you can probably put them in a warm room, a hot box, the cab of your truck — anyplace warm — and tube them with warm colostrum.

"The advantage of a hot box is that the air is warm and calves are breathing warm air into their lungs," Campbell adds. "The lung surface is actually their biggest body surface, so circulating warm air in a hot box is helpful."

If the calf's temperature is much below 95, the hot box or warm room will not help enough, especially if the calf is already dry. Hair serves as insulation; it not only keeps things hot but can also keep things cold.

"I've put some of these calves, with temperatures down to 80 degrees Fahrenheit, or less, in a hot box and left them there for hours and they don't warm up," Campbell notes. "Their interior body temperature is so cold, and the dry hair so insulating, that a hot box won't help them as much as you'd expect."

Campbell believes the fastest way to warm these calves is with warm water because the direct contact is quicker than warm air. Campbell suggests placing calves in a tub with a water temperature around 101 degrees Fahrenheit. Once the calf is in the tub, it will take effort to warm it.

"You've put this giant ice cube in the water, and the water cools down quickly. The water must be warmer than the calf, so you have to keep changing it," Campbell explains. "It is labor-intensive and someone needs to be there in case the calf can't hold its head up. A big laundry tub works nicely because you can fold the calf in there with its head upright."

Along with externally warming the calf, providing energy and internal warmth is the next vital step in the survival of a young, chilled calf.

Colostrum

Timely ingestion of colostrum is the next important factor in equipping calves to handle cold weather. If a calf becomes too chilled before nursing, it may not absorb antibodies as readily when fed.

"Any stress — whether from cold or a difficult birth — can interfere with optimum absorption," Daly says. "If it's a question of warming the calf or giving him colostrum first, don't delay on the colostrum."

Daly points out colostrum is sometimes overlooked while ranchers focus on warming the calf. After working with a study in which some calves were fed colostrum and others were not, Daly saw the benefits of colostrum firsthand.

"It was very obvious which calves had gotten colostrum and which ones didn't," Daly notes. "There's much more to colostrum than just antibodies. It contains much higher levels of fat and protein than regular milk."

Warm colostrum helps warm calves internally. The high fat content provides energy to create body heat. Colostrum should not be too hot but similar to the cow's body temperature (101.5 degrees).

After a newborn calf gets an adequate amount of colostrum, it is able to quickly absorb the lipids and amino acids, which aid physiology and metabolism. The calf's body does not have to burn so much brown fat to keep warm. Colostrum can mean the difference between survival and death for a young calf.

Prevention is key

"Studies show that calves that have undergone cold stress are more likely to have problems with scours, pneumonia and other infections," Daly says.

Thus, it is important to try to prevent cold stress before it happens. Paying attention to cows' nutrition precalving is important, as is watching weather predictions and making sure cows have lots of bedding and a suitable environment for calving.

"If you know you'll be having a storm or cold weather, get calving cows out of the elements and take care of any calves born outside as quickly as possible," Daly says. "Newborn calves can handle relatively cold temperatures with no wind. But if there's wind or precipitation with the cold, they lose too much body heat from being wet. They need to be dried as soon as possible."

A relatively warm, windy day can be deceptive. Even if the temperature is not terribly low, the wind or precipitation may chill calves quickly. The situation becomes an emergency when the chill makes it impossible for the calf to get up and nurse.

"I would worry more about a 32 degree temperature with wind and precipitation than a colder day with no wind," Daly says.

Late winter storms can put newborns at risk, even during spring calving. Some years, more calves are lost to bad weather during spring calving, because ranchers with spring-calving herds may not be as prepared for dealing with cold stress.

Keeping calving cows out of the elements and routinely monitoring them can improve calf survival rates. While this task may be difficult for larger herds calving in a narrow interval, Daly still believes actively checking calving cows is a worthwhile effort.

"Anything you can do to prevent or reduce difficult births will help, such as genetic selection for easy-calving bulls and attending [to] dystocia problems in a timely manner," Daly notes. "There is data that shows lower survival rates in calves that had to be pulled."

Daly believes cold stress in calves may also be aggravated by nutritional issues in cows. If the cow is in poor body condition or does not have adequate protein and energy in her diet during late gestation, the newborn calf will have decreased amounts of brown fat. Decreased energy reserves leave a calf more vulnerable to chilling.

When calving early, cows are generally on harvested feeds or supplements rather than green grass during the last crucial weeks of pregnancy. "It's sometimes hard to separate out the nutritional factors and bad weather," Daly says. These can be interrelated in causing weak calves.

"In this part of the country, periods of bad weather may affect ranchers' ability to feed the cows," he says. "Pastures may snow under, roadways may drift shut, and in some instances, it may be impossible to take feed to the cattle.

"Protein and energy are crucial, and research shows that supplying supplemental fat to cows during late gestation will help the calf be better prepared to handle cold weather. Much of what producers can do regarding cattle feeding revolves around economics and logistics — how to supply some of those ration ingredients." Cows which receive adequate levels of protein produce a healthier fetus and a more vigorous calf at birth and have fewer calving problems.

The health of a calf begins at birth. Calves born during cold winter months are susceptible to a multitude of threats. Knowing how to identify and assist chilled calves not only increases survival rates but sets calves up for healthier, more productive futures in the herd. **HW**



Maintaining adequate body temperature in newborn calves is critical to their health and growth.

PHOTO BY KELLY FRIEDEN

Weak calf syndrome

Several decades ago, some ranchers with early calving herds were losing young calves to what was known as weak calf syndrome. Studies during the 1970s determined this condition was primarily an issue in calves from young cows (two- and three-year-olds) and was caused by a deficiency in dietary protein during late gestation.

Beginning in 1971, a research group from the University of Idaho collected and analyzed thousands of blood and tissue samples from healthy calves and weak calves and from their dams. The research, led by Richard Bull, Ph.D., found that the weak calves — born from protein-deprived dams — did not absorb antibodies from colostrum efficiently. When these calves were stressed by cold, the duration and efficiency of antibody absorption from colostrum were greatly reduced. If the immune system of a newborn calf is already compromised because of protein deprivation in the dam, the likelihood is high for the development of weak calf syndrome.

The University of Idaho researchers worked with four cooperating ranches that had a history of weak calf syndrome. These ranches varied in herd size from 150 to 1,100 cows. During the study, all four herds were fed a customized mineral supplement developed by Bull to make sure the problem was not due to a mineral deficiency. Protein levels of feeds were tested. On two of the ranches, the protein levels for young cows were increased by using higher-quality forage or a protein supplement. Weak calf syndrome was virtually eliminated on those two ranches, while incidence remained the same on the other two ranches.

Bull was able to demonstrate in subsequent studies that the protein requirement of two-year-old cows in the last 45 days of gestation is 1.81 pounds of crude protein per day. As a result of Bull's research, the National Research Council increased its recommendation for protein requirements of young cows. The general recommendation today is a diet of 7 percent crude protein for mature cows and 10 percent crude protein for young cows. **HW**