Caring for Cow Herds During Cold Weather

Cattle must maintain a core body temperature of approximately 101°F in order for their body systems to function normally. Beef cattle that are composed primarily of *Bos taurus* genetics are adapted to cool climates and tolerate cold temperatures remarkably well. Adapted mature cattle with a heavy winter hair coat have a thermoneutral zone that extends down to about 20°F, commonly referred to as the Lower Critical Temperature (LCT). Effective temperatures within the thermoneutral zone mean that cattle do not need to expend additional energy to maintain proper core body temperature. As the effective temperature drops below 20°F, cattle will need increased dietary energy to maintain a normal body temperature, meet maintenance or gestation requirements, and retain body condition.

The effective temperature that cattle experience is impacted by the environment, particularly air temperature and wind speed. Although wind chill temperature for humans is useful to predict cold stress in cattle, wind chills do not accurately determine the effective temperature for cattle due to their increased hide thickness and hair coat.

While cold stress cannot be completely eliminated for cattle housed in typical outdoor facilities in the Midwest, several management practices can help to reduce the impact of cold stress and decreased potential health and performance setbacks.

Shelter

As illustrated in Figure 1, wind can dramatically reduce the effective temperature that cattle are experiencing. Additionally, humidity and precipitation negatively impact a cow's ability to cope with cold weather. A cow with a wet hair coat has a Lower Critical Temperature (LCT) of 60°F compared to a LCT of 20°F for a cow with a dry hair coat. Therefore, protection from both the wind and precipitation is important for cows during the winter. At a minimum, a windbreak is necessary to provide cows shelter from 20–30 mph winds common in January and February.

Wind Speed mph	Actual Thermometer Reading °F: 20	10	0	-10	-20
	Equivalent temperature °F				
0	20	10	0	-10	-20
5	13	3	-6	-16	-27
10	8	-1	-11	-21	-31
15	5	-5	-16	-25	-36
20	0	-10	-21	-30	-41
25	-8	-18	-28	-38	-48
30	-16	-27	-36	-46	-55
	Zone 1: Little danger to mature cattle	Zone 2: Increasing danger; cold stress, potential frostbite		Zone 3: Greater danger, especially calves	

Figure 1. Effective Temperature for mature *Bos taurus* cows with a dry, heavy winter hair coat. (Adapted from Ames and Insley, 1975)

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Figure 2. Cattle sheltering behind a natural windbreak.

Natural windbreaks such as timber or brush can be effective and low-cost in some areas if located close to the winter feeding or calving areas. Temporary windbreaks using hay or stalk bales are inexpensive and can be positioned where they are needed, although snow dropping behind the windbreak due to their solid nature may limit their effectiveness.

Permanent windbreaks can provide excellent wind protection but require some considerations prior to building to maximize effectiveness. In order to withstand wind gusts, permanent structures should utilize at least 8-inch posts that are set 4–5 feet in the ground. Movable windbreaks, such as those constructed from steel tubing with cross planks, should be wider than the height for adequate support. Windbreaks should be porous rather than solid sided, as solid windbreaks deposit snow directly behind the windbreak and on top of the cattle. A porosity of about 25% will adequately reduce wind speed while still allowing enough wind through the windbreak, extending the location of snow drift to about 10 times the height of the windbreak. For example, six-inch boards spaced two inches apart gives 25% porosity. Typically, windbreaks are designed to be 10 feet tall. When considering length, plan to allocate at least one foot of linear space per cow to provide enough shelter. All windbreaks should be positioned perpendicular to the prevailing winter wind.

While buildings or sheds can provide good shelter, without proper management, facilities can be problematic due to ventilation and bedding issues, particularly for calves. Poor ventilation traps moisture within the building and increases stress on the animals' respiratory system. Added moisture also accelerates heat losses, which can contradict the purpose of providing shelter. Space requirements for shelters vary depending upon stage of production and length of usage. Bulls and dry cows provided with temporary shelter during a storm only need 20-30 square feet while longer confinement increases minimal space needed to 50–80 square feet. Cow-calf pairs should have at least 100 square feet if under roof. Confined cow operations managed under roof provides excellent shelter for cows and calves but also has increased costs for the facilities, bedding and manure management.

Adequate, dry bedding helps reduce the impact of cold weather by providing a layer of insulation between the cold ground and the animal's body. Feeding trials in feedlots indicate that maintenance requirements can be 20–40% higher for calves without bedding during winter feeding periods. When cattle lay directly on cold ground, they lose body heat by conduction to the cold ground, thereby increasing the amount of cold stress experienced. Contact with extremely cold ground for extended periods of time can result in frost bite, particularly on the scrotum of bulls and teats of cows. Deep, dry bedding provides insulation to reduce cold stress and the risk of frostbite. Accumulation of wet, soiled bedding must be prevented to keep cattle dry and maintain the insulative effect of the hair coat to reduce cold stress.

Nutrition

Feed

Cold stress increases maintenance energy requirements but does not impact protein, mineral or vitamin requirements. As a general rule of thumb, for every degree that the temperature is below the Lower Critical Temperature (LCT), a cow's energy needs increase by 1%. For example, with every 10°F drop in temperature below the LCT of 20°F, a female in adequate condition with a dry hair coat would benefit from receiving one additional pound of corn supplementation. Wind speed, humidity, hair coat thickness, moisture and presence of mud play a role in determining the LCT. Therefore, underconditioned cows or cows with wet hair coats have a higher LCT and require more energy supplementation than a cow in adequate condition or with a dry hair coat. In this situation, these females at greater risk of cold stress would benefit from receiving two or more pounds of additional corn supplementation.

Figure 3. Cows need supplemental feed in winter.

During periods of cold stress, a cow's natural response is to increase intake. While increasing forage intake may be sufficient for a couple of days, if the cold stress period is prolonged beyond a few days, energy supplementation may be more advantageous than simply supplying more hay.

The peak of heat production from fermentation occurs 4–6 hours post consumption, which naturally increases core body temperature. Therefore, feeding cows later in the afternoon or evening will utilize the heat of fermentation to the cow's advantage, resulting in increased body temperature coinciding with the coldest hours of the night.

Thinner cows have less fat cover and therefore require additional nutrients to combat cold stress. Managing younger females and thinner mature cows separate from the mature cows in adequate condition makes for improved ability to better match requirements with feed resources.

Water

Adequate water intake is necessary to mobilize nutrients throughout the body. Therefore, if water intake is restricted, feed intake will decrease. During winter months, water requirements are at their lowest, approximately one gallon per 100 pounds of body weight. However, excessively cold water, such as from a natural water source, may also limit water intake. While cows can and will eat snow to assist in meeting their water requirements, relying on snow as the sole water source is insufficient. Producers should strive to provide consistent access to a fresh water source and consider the water source location relative to feeding areas and windbreaks to encourage water intake without compromising water quality.

Calving

Mature cows can tolerate cold temperatures, but wet newborn calves cannot. Producers targeting January or February calving will have increased issues with cold weather. Proper planning and facilities are critical for ensuring viable calves during cold weather calving. Facilities for early calving herds should be draft-free, dry with clean fluffy bedding such as straw or corn stalks, and should have bonding pens for the cow and newborn for a day or two depending on the weather. A good rule of thumb is to have enough bonding pens for 8–10% of the number of cows calving.

Traditional spring calving seasons typically start after the worst of the winter weather, but may still have spring blizzards that result in calving losses. Keep expectant cows close to the calving facilities when spring storms are predicted. Facilities should be thoroughly cleaned in fall when weather permits and after each pen is emptied during the calving season. Calves can become easily chilled during cold spells, especially in muddy conditions. Neonatal calves that have become hypothermic (core body temperature lower than 100°F) will need a supplemental heat source. In many cases, moving calves to a warmer environment will allow the calves to recover. Extremely cold calves will need a more intensive heat

source. Placing the calf in warm water (105°F) is the most effective warming method but may not be practical in some circumstances. A hot box can be used but temperature should not exceed 105°F and ventilation is required to provide adequate oxygen and reduce moisture buildup. A calf that has a core body temperature of 90°F can be rewarmed in about an hour in a warm water bath compared to two hours in a warm forced air heating box.

Figure 4. Protected bedding areas important for calves.

Bulls

Bulls should be separated from the spring calving cow herd during the winter, and after the breeding season is completed for fall calving herds. Bulls tend to tolerate winter weather well due to their larger body mass and lower nutritional requirements, but bedding is a necessity for bull pens. Extreme cold increases the risk of frost bite on the scrotum and can increase the risk for reduced sperm production and lower semen quality. It takes 45–60 days for sperm production to return to normal following frostbite, and severe frostbite can cause permanent damage.

For many herds, winter months are a time to add weight to bulls to ensure they are in ideal condition for spring breeding season. Similar to cows, age, condition, and hair coat play a key role in a bull's winter nutritional requirements, especially during cold stress periods. To reduce the effects of cold stress on bulls, maintain a body condition score around six, provide sufficient nutrition, water, protection from wind and rain, and adequate bedding.

Emergency Planning

Severe winter storms can have devastating effects on the cow herd. Drifting snow can trap cattle, cover water sources and prevent the ability to provide adequate feed. If possible, cattle should be moved to a bedded shelter where feed can be provided prior to the storm as it may be difficult to move cattle once the storm begins. It may be advantageous to provide abundant hay prior to the storm to help cows endure the storm and as insurance if unable to feed on a normal schedule. Typically, cattle will increase their feed intake prior to a severe storm and again the day following severe storms to compensate for decreased intake during the storm. Neonatal calves are especially vulnerable to storms. Calves need a dry area protected from wind and precipitation. Ideally, this area should be accessible only to calves to prevent mature cows from displacing calves and soiling the bedding. Late gestation cows should be observed closely and brought into a calving area prior to the storm, if possible. Often cows that are close to parturition will calve just prior to the storm.

Ice storms can be challenging for cattle. Cattle are hesitant to walk on slippery surfaces and may panic and fall with unsure footing, leading to injuries and possible abortions. Icy areas around water and feeding areas can be mitigated by covering with a thick layer of sand, composted manure or bedding material to keep cattle from slipping. In blizzard conditions, cattle may drift with the wind into unsafe terrain, while cattle that are in a sheltered area will be unwilling to leave that shelter during the storm.

Severe storms can cause serious disruptions to management and put cattle welfare at risk. Downed power lines over a large area during an ice or wind storm may result in electrical disruptions for many days or weeks. For rural cattle producers, this may severely impact the ability to provide basic necessities for cattle. Without alternative power sources, water tanks may freeze, well pumps may not operate, and tractors may not start. A generator(s) that can supply ample electricity to maintain not only the residence but also the livestock should be available and in good working condition with plenty of fuel on hand. Generators should be started and run monthly to assure working condition. Propane tank heaters can be used to keep tanks thawed.

Hay and bedding should be available where it will be needed in the event that tractors are unable to start or cannot reach cattle for several days. Other

services may not be available for an extended period. Propane tanks should be monitored regularly and kept at least half full to sustain operation if needed. Road conditions may prevent a veterinarian from reaching the operation to provide medical care such as calving emergencies. Injured or debilitated livestock may need to be euthanized and their carcasses removed from the immediate area.

Written emergency plans should be prepared and easily available in the event you are not present. At a minimum, emergency plans should provide daily feeding and care instructions, emergency contact information, and details on where emergency supplies (generator, fuel, etc.) can be found.

Transportation

Transportation of cattle in severe cold and wind (effective temperature below 0°F) should be avoided if possible. In these conditions, the welfare of the cattle is at increased risk and the possibility of a road emergency is increased, putting cattle and humans at more risk. If necessary, cattle should be delivered as quickly as possible, and stopping for extended periods should be avoided. Trailers should be well-bedded using wood shavings or straw. Additionally, it may be advantageous to close ventilation slats along the bottom of the trailer to minimize road spray and close any vents on the nose of the trailer to reduce wind chill. Keep upper slats along the trailer sides open to provide adequate ventilation; otherwise, moisture may accumulate and freeze, making cattle colder.

Conclusion

Cold weather and the associated stress that comes with it is unavoidable in the Midwest. Adequate planning and advance preparation can help to reduce the impact of cold on cattle welfare, health and performance. Bos tarsus cattle are cold hardy and can tolerate the cold better than most domesticated animals, but do require adequate shelter and nutrition to endure bitter cold weather.

Authors

Written by Grant A. Dewell, associate professor and extension beef veterinarian; Erika L. Lundy, extension beef specialist; and Denise L. Schwab, extension beef specialist.

Photos contributed by Beth Reynolds, Grant Dewell, and Erika Lundy.

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