



Dealing With Heat Stress in Beef Cattle Operations

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This feedlot steer is experiencing heat stress. (Photo by Carl Dahlen, NDSU)

Being proactive is the best approach for dealing with heat stress in cattle. Once cattle are in a severe state of heat stress, you may be too late to help them. Interventions that cause animals to cool extremely rapid or animal distress could have disastrous consequences. Having a solid management plan in place to address heat stress could pay big dividends in the form of maintained animal performance during periods of heat and in avoiding death losses in severe cases.

Introduction to Thermoregulation

Mammals have involuntary methods of regulating internal body temperature. They include shivering and sweating to maintain “homeostasis,” or a constant, stable environment. Homeostasis is good, and, as cattle managers, we regularly use it to our benefit. Using a thermometer to determine if a calf has a fever is only possible because of homeostasis.

The thermoneutral zone is the range of temperatures in which an animal (including humans) does not use energy to stay warm or stay cool. When temperatures rise above the thermoneutral zone, animals must expend energy to cool their bodies. Signs this is occurring include an increasing respiration rate, increased heart rate and increased panting. At the same time the animals use extra energy, their feed intake declines.

Heat stress occurs when the animal's attempt to dissipate heat is unsuccessful or overwhelmed, and the animal's performance or health suffers as a result.

Managing Heat Stress

Step one:

Identify animals that are most susceptible to heat stress.

Feedlot animals that are closest to the market endpoint are the most at risk. They are physiologically overweight and have the least amount of lung capacity relative to body weight.

Animals that are very young and very old also are at increased risk. They do not have the physiologic reserves to withstand prolonged periods of heat.

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Animals with dark hides are at a higher risk of suffering heat stress and dying. Deaths of black-hided cattle on pasture without shade and limited supplies of water have been recorded. Body core temperature research has shown that in a cohort of cattle that were genetically closely related but phenotypically had different hide colors, cattle with dark hides had a 2 F higher core body temperature than their cohorts with lighter-colored hide.

Know where the animals most susceptible to heat stress are before the danger of heat stress is present. Be prepared to have these animals as a priority in your prevention/intervention plan.

Step two:

Develop an action plan for heat stress. The action plan is the essential actions you will take to protect the animals most susceptible to heat stress. The action plan should include the following:

■ **Animals in heat stress need to drink water.**

Water trough capacity often is overlooked in Northern environments. Large amounts of water space typically result in winter freeze-ups, so producers tend to utilize smaller water troughs than recommended, especially for periods of heat. Most of the year, this type of water trough may provide animals with a sufficient water supply, but during periods of heat stress, water intake increases dramatically.

Each animal should have access to at least 2 inches of linear trough space per head in a pen. This will allow cattle access to water and prevent socially dominant animals from stopping subordinate animals from drinking. This means that in a pen with 200 animals, you need to have 400 inches of linear water space. If your cattle have access to only small water troughs, you should add space for water access during the summer months.

Evaluate water supply lines and ensure you have sufficient water pressure and flow capacity available to keep troughs full during times of peak water consumption. Imagine every calf that could possibly fit at a water trough drinking at the same time.

■ **Move the animals' feeding time to late afternoon or evening.** This will allow rumen fermentation to take place during the cooler night temperatures, and it will increase lung capacity for the cattle during the hotter daytime temperatures. Normal digestive processes create heat in cattle. This body heat reaches a maximum several hours after the meal is consumed. When feeding cattle in the morning of high-heat-stress days, producers may be matching peak environmental temperature with peak body temperature from digestion. Altering feed deliveries accordingly can avoid some potential additional heat from digestion.

If feeding once daily, consider moving feed delivery until the afternoon. If feeding multiple times daily, consider feeding a small meal in the morning and a larger portion of the diet later in the afternoon. Decrease the amount of feed offerings during and for several days after heat stress. Effects of heat stress may linger, and aggressively increasing feed deliveries will increase metabolic heat production and possibly cause problems even though the environmental heat index has dropped below the typical heat stress threshold.

■ **Air movement is an additional factor that promotes animal cooling.** A breeze or wind moving over the hide of cattle promotes evaporative cooling. Blocking or hampering the movement of air impedes evaporative cooling.



When water is available, cattle may seek it to alleviate heat stress. (Photo by Carl Dahlen, NDSU)



Cattle will congregate naturally under available shade. Provide shade if possible. (Photo by Carl Dahlen, NDSU)

The same windbreaks, trees or other protections that are so vital during the winter to prevent frostbite and hypothermia can prohibit wind from circulating in pens during the summer. Remove unessential wind barriers (portable wind panels, equipment, weeds and other objects) to promote better air movement. Having mounds in pens gives cattle more elevation and possibly access to a microclimate with more wind.

■ **Cool the ground and the cattle gradually.**

Sprinklers function to cool the ground cattle are lying on as much as they do to cool the cattle. Set up sprinklers well in advance of anticipated heat stress because cattle take time to adapt to all changes. Use the sprinklers during mildly hot days so cattle become accustomed to the sights, sounds and the cooling effects of the sprinklers.

Be aware of the droplet size of water coming from the sprinklers. The goal is to have large droplets of water. A fine mist likely will make the pens even more humid and contribute to greater heat stress.

An alternative to sprinklers is running a hose into pens to wet the ground where cattle will be lying. Run the sprinklers or wet the ground the cattle will be on before the peak temperatures of the day.

■ **Provide shade if possible.** Solar radiation from sunny, clear skies contributes to body temperature in cattle. Black-hided cattle in the same pens with white-hided cattle will have internal body temperatures several degrees hotter than the white-hided cattle. Providing shade stops solar radiation from increasing body temperature. Although this may not be practical for all cattle in a feed yard, identify susceptible pens and be ready to intervene proactively with all measures possible.

Consider turning cattle out temporarily under trees for shade. The decrease in feed efficiency or loss of weight is minimal, considering the potential cost of losing cattle due to heat stress.

■ **Adding bedding to the ground can reduce the temperature of the ground on which cattle are lying.** Work done in Midwestern feedlots indicates that simply spreading straw on the ground can decrease the ground surface temperature by 15 F, compared with black dirt. Apply bedding to the tops of mounds and other areas likely to have wind. Wetting the bedding before or shortly after putting it out can reduce the temperature even further.

■ **Control flies as much as possible** because hot cattle tend to bunch together and flies only will add to the stress of hot days.

■ **And maybe the most important, do not work cattle during temperature extremes.** If working cattle is absolutely necessary, keep working time as short as possible, use calm animal-handling techniques to minimize stress related to handling, and consider running smaller groups through the facility or into holding pens. Provide sufficient water in holding pens. Get started as early in the morning as daylight will allow. Do not work in the evening after a heat-stress day; cattle need this time to recover. Reconsider the necessity of working cattle during these periods; some working events need to be postponed or canceled.

■ **Pay attention to long- and short-term weather forecasts and have a copy of the temperature humidity index chart readily available.** Determine the potential risk threshold and be prepared, even if the risk is several index units away. Additional solar heat, lack of air movement and heavy fat cover all can lead to disastrous effects of heat stress.

Heat in summertime is not avoidable. However, you can take preventive measures when designing facilities and before temperatures reach dangerous levels to minimize impacts of heat stress on cattle.

Livestock Weather Hazard Guide

		Relative Humidity (%)																													
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100										
Dry Bulb Temp. (F)	75									70	70	71	71	72	72	73	73	74	74	75	75										
	76								70	70	71	71	72	72	73	73	74	74	75	75	76	76									
	77								70	70	71	71	72	72	73	73	74	74	75	75	76	77									
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	79								70	70	71	71	72	72	73	73	74	74	75	75	76	77	78	79							
	80								70	70	71	71	72	72	73	73	74	74	75	75	76	77	78	79	80						
	81								70	70	71	71	72	72	73	73	74	74	75	75	76	77	78	79	80	81					
	82								70	70	71	71	72	72	73	73	74	74	75	75	76	77	78	79	80	81	82				
	83								70	71	71	72	72	73	73	74	74	75	75	76	77	78	78	79	80	80	81	82	83		
	84								70	71	72	72	73	73	74	74	75	75	76	77	78	78	79	80	80	81	82	83	84		
	85								71	72	72	73	73	74	74	75	75	76	77	78	78	79	80	81	81	82	83	84	84	85	
	86								71	72	73	73	74	74	75	75	76	77	78	78	79	80	81	81	82	83	84	84	85	86	
	87								72	73	73	74	74	75	75	76	77	77	78	78	79	80	81	81	82	83	84	85	85	86	87
	88								72	73	74	74	75	75	76	76	77	78	78	79	80	81	81	82	83	84	85	85	86	87	88
	89								73	74	74	75	75	76	77	77	78	78	79	80	80	81	82	83	84	85	86	86	87	88	89
90								73	74	75	75	76	77	77	78	79	79	80	81	82	83	84	85	86	87	87	88	89	90		
91								74	75	76	76	77	77	78	79	80	81	82	83	84	85	86	86	87	88	89	90	91			
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96								76	77	78	79	80	81	82	84	84	86	87	88	89	90	91									
97								77	78	79	80	81	82	83	84	85	86	87	88	90	91										
98								77	78	79	80	82	83	84	85	86	87	88	89	90											
99								78	79	80	81	82	83	84	86	87	88	88	90												
100								78	79	80	82	83	84	85	86	87	88	90	91												
105								80	82	83	84	86	87	89	90	91															

Alert
Danger
Emergency

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Step three:

Know when to intervene. Heat stress is driven by a combination of factors. Temperature and humidity are two of the most frequently cited issues. A Livestock Weather Hazard Guide is included. Understanding that heat stress in cattle is cumulative is important. If the evening temperatures do not cool low enough, cattle cannot fully recover physiologically before the next onset of heat. Cattle are at danger of death from heat exposure when the following occur:

- The heat index is 75 or greater for a 72 hour period
- The heat index during a 48 hour period is no lower than 79 during the day and no lower than 75 during the night
- The daytime heat index reaches 84 or higher for two consecutive days

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