Best Practices for Managing Heat Stress in Feedyard Cattle

Prepared for Certified Angus Beef LLC
by Dr. Terry L. Mader,
Mader Consulting LLC, Gretna, Nebraska

These guidelines have been developed based on published research information as well as practices known to be effective in managing and mitigating heat stress in feedyard cattle. They are intended for producers, managers, veterinarians, and nutritionists to use during times when weather conditions are conducive to heat stress. These guidelines are designed for implementation prior to the manifestation of such conditions (Strategic Plan) or at the onset of heat stress (Emergency Plan).

To the extent possible, cattlemen must anticipate any crisis in an effort to obtain maximum benefit from a plan. Evaluate the previous history of heat events and the potential for a heat stress event to occur at your location. Remember dark-hided and finished cattle are more prone to heat stress than light-hided or thinner cattle. Also, animals do adapt to heat stress, however, the fattening process, in itself, negates some of the adaptation that occurs with prior exposure.

Components of a heat stress management plan are:

1. **Monitor weather forecast and conditions.** Weather forecast of hotter than normal conditions should signal an early activation of a heat stress management plan. The greatest probability of heat stress is between early July and mid-August, although in the continental US heat stress can easily occur anytime between June 1 and September 30.
2. **Anticipate weather changes.** A sudden rise in temperatures over 2 to 4 days, especially after a rain event, often results in elevated humidity that contributes to heat stress. Cattle located in these areas are more susceptible to heat stress, particularly if air flow is restricted or below average. Use panting score measures to monitor heat stress (Table 1). Panting scores of 2 indicate the onset of heat stress and should initiate plans for improving cattle comfort.
3. **Keep current on marketing finished cattle.** During the months of July and August, cattle or groups of cattle, should be sold immediately upon reaching market weight and finish. Shipping cattle to arrive at packing plants before 6 a.m. is also encouraged to allow the animal to cool down before daily temperatures begin to rise significantly.
4. **Do not work or process any cattle past early morning.** If it is predicted to be a particularly hot day, reschedule working cattle to another day. Minimize holding time in crowded working facilities. Processing cattle can raise body temperature 2 degrees or more, which will further contribute to heat stress.
5. **Insure that an adequate water supply is available.** During hot periods, water intake may increase by as much as 50%. If cattle are crowding existing waterers and other cattle are not allowed to drink, place stock tanks filled with cool clean water in pens to allow all cattle to drink and minimize crowding. Water is needed to prevent dehydration, but many animals will drink and use extra water just to cool the body by placing the tongue and nose in the water to take away body heat. Increasing linear waterer space from the normal 0.75 inches per head to over 2 inches/head has been shown to significantly decrease heat stress. Take note of water demand and be prepared for any disruption of that supply.

6. **Wet down a portion of the pen or mounds.** Standing near or lying on a cool surface enables body heat to be dispersed to the cooler, surrounding surface. As feedyard surfaces heat up the animal has no place to dissipate heat to. Wetting 20 square foot of pen space or more per animal will allow sufficient room for all animals to get relief from the heat. Also, wetted surfaces will minimize dust. Try to avoid over-wetting or creating muddy areas.
7. **Set up sprayers or sprinklers to wet down cattle.** Care must be taken to not cool off hot cattle too rapidly. Therefore, it is preferred that sprinkling begin in the morning before cattle get hot. Large droplets of water, applied as a spray at 5 to 10 minute intervals once or twice per hour, are recommended rather than continually misting. A mist does not allow water to penetrate the hair coat as well as a spray does. Optimum cooling requires that the skin gets wet and not just the hair. Wetting cattle or pen surfaces may require an additional 5 to 15 gallons of water per animal per day. This may double the amount of water normally used. Set-up facilities, accordingly.
8. **Maximize airflow to the most susceptible cattle.** Cattle require a minimum of 5 to 10 mph wind for optimum cooling to take place. Wind breaks and other obstructions will create calm air flow 5 to 10 feet downwind for every one foot in height. Do not have fat cattle in pens in which airflow is restricted by windbreaks or other structures which could reflect heat back towards the animal. Place lighter weight cattle in these pens, which are going to be finished after summer is over.
9. **Alter feeding schedule or ration.** Change cattle feeding habits by feeding over 50% of the total daily ration after peak daily air temperatures have occurred (see suggested strategic plans below). Do not be overly concerned that cattle are dropping off on intake. Lowering feed intake is a natural survival mechanism used by the animal to minimize overall heat impact. Consider adding fat to the diet to lower heat increment. Feeding MGA to heifers has also been found to lessen heat stress.
10. **Control flies and other parasites which bother cattle.** Fly problems occur almost simultaneously with warmer weather. Feedyard cattle group together to shield themselves from biting flies. When this occurs under hot conditions, cattle inside the group can become over-heated.
11. **Provide shade options for cattle.** Consider permanent or temporary shading structures for dark-hided and/or market ready cattle of higher risk to heat stress. Also, cattle in hospital pens should have shade or shelter available.
12. **Consider the combined impact of flies, airflow restriction, coat color, and body condition.** The number and duration of summer heat waves are unpredictable. Cattle that are closest to being finished need to be in the most comfortable, open pens of the feedyard.
13. **Monitor early warning signs of heat stress.** Early morning dewpoint temperatures and/or temperature humidity index (THI) above 70 are good indicators that cattle did not cool down at night. Utilize a THI Chart (below) to monitor heat stress levels. Forecast and current daily heat stress levels for cattle can also be monitored at www.ars.**usda**.gov/npa/**marc**/**heatstress.**
14. **Develop both an emergency and strategic heat stress plan.** Planned management alternatives, such as the strategic use of sprinklers, shade, or added water space need to be part of a heat stress management plan to help cattle cope with adverse conditions. In addition to the above mentioned changes, manipulation of diet energy density and intake may also be beneficial. Example feeding/management plans are shown below.

STRATEGIC PLAN
(Long-term)

Conditions
Begin strategies at beginning of summer or 1 week prior to when signs of heat stress tend to occur. Resume normal management once summer heat subsides.

Response
- Feed cattle so as to minimize metabolic heat load occurring at peak of daily environmental heat load. If weather conditions are indicative of heat stress occurring, deliver no more than 30% of total feed at the AM feeding plus feed prior to 6 AM. Monitor cattle and feed balance of ration later in the afternoon.
- Use one or all of the following cooling strategies;
    - If pen surfaces are dry, periodically sprinkle or dampen surfaces to maintain a cool environment for cattle to dissipate heat.
    - Provide shade (20+ ft^2/head) at a height of at least 8' (10' - 12' preferred) above pen surface.
    - Add tank or other watering devices to insure a minimum of 2 linear inches (3 linear inches preferred) of water space/head.
- Move at risk cattle to pens with best air-flow.

STRATEGIC PLAN
(Immediate)

Conditions
THI ≥ 70 any time between 6:00 and 9:00AM (based upon these conditions at this time, there is a high probability that heat stress will be present during the day assuming little or no wind or cloud cover is present).

Response
- Alert yard personnel to begin monitoring cattle closely, paying particular attention to those animals most at risk.
- To minimize effects of metabolic heat load, alter feeding regimen (one of three ways)
    - Reduce morning feed amount to no more than 30% of total expected daily intake.
    - Deliver feed at least 3 times per day with greatest amount fed at the last feeding.
    - Although more difficult to manage, keeping bunks empty until noon or limiting feeding cattle are also acceptable strategies to reduce metabolic heat load.
- Keep in mind that altering rations and feeding programs are not without risk, particularly when it cools down and cattle resume normal feeding activity. The key is to keep metabolic heat from contributing to heat stress, while at the same time not letting the cattle get too hungry and overeating when the heat subsides.
- If sprinklers are used, begin sprinkling pen surface by 10:00AM. For best results avoid sprinkling areas around waterers.
- Delay processing/re-processing to another day

EMERGENCY PLAN

(Immediate, if strategic plan not used)

Conditions

THI ≥ 79 at any time during the day

Response

- Sprinkle cattle or feedyard surface. Main objective should be to provide immediate relief for cattle.
- Secondary objective is to cool the pen surface, using water sprayer to allow for conductive and radiative heat transfer away from the animal
- Wetting cattle must be maintained on a daily basis until heat abates.
- Provide cattle with an additional drinking water source.
- If cattle are to be fed in the afternoon, alter delivered amount to adjust for a 20 to 60% decrease in total dry matter feed intake.
- Consider moving cattle to a storm ration/higher roughage diet to decrease metabolic heat production and aid in keeping cattle on feed.

Table 1. Panting scores for feedyard cattle (Mader et al., Anim. Sci. 2006)

Score	Description
0	Normal respiration (~60 to 90 breaths/minute, bpm)
1	Elevated respiration (~80 to 110 bpm)
2	Moderate panting and/or presence of drool or small amount of saliva (~100 to 130 bpm)
3	Heavy open-mouthed panting; saliva usually present (~120 to 140 bpm)
4	Severe open-mouthed panting accompanied by protruding tongue and excessive salivation; usually with neck extended forward

A score of 2 is a very good indicator of potential heat stress; implementation of planned heat stress mitigation strategies should be considered, especially if this is observed in the morning.

Chart - Temperature-Humidity Index (THI)

Temperature (F) - Current Hour	Relative Humidity													
	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
105	83	84	86	87	88	89	91	92	93	95	96	97	99	100
104	82	84	85	86	88	89	90	91	93	94	95	96	98	99
103	82	83	84	86	87	88	89	91	92	93	94	96	97	98
102	81	83	84	85	86	87	89	90	91	92	94	95	96	97
101	81	82	83	84	86	87	88	89	90	92	93	94	95	96
100	80	82	83	84	85	86	87	88	90	91	92	93	94	95
99	80	81	82	83	84	85	87	88	89	90	91	92	93	94
98	79	80	82	83	84	85	86	87	88	89	90	91	93	94
97	79	80	81	82	83	84	85	86	87	88	89	91	92	93
96	78	79	80	81	82	83	85	86	87	88	89	90	91	92
95	78	79	80	81	82	83	84	85	86	87	88	89	90	91
94	77	78	79	80	81	82	83	84	85	86	87	88	89	90
93	77	78	79	80	80	81	82	83	84	85	86	87	88	89
92	76	77	78	79	80	81	82	83	84	85	85	86	87	88
91	76	76	77	78	79	80	81	82	83	84	85	86	86	87
90	75	76	77	78	79	79	80	81	82	83	84	85	86	86
89	75	75	76	77	78	79	80	80	81	82	83	84	85	86
88	74	75	76	76	77	78	79	80	81	81	82	83	84	85
87	73	74	75	76	77	77	78	79	80	81	81	82	83	84
86	73	74	74	75	76	77	78	78	79	80	81	81	82	83
85	72	73	74	75	75	76	77	78	78	79	80	81	81	82
84	72	73	73	74	75	75	76	77	78	78	79	80	80	81
83	71	72	73	73	74	75	75	76	77	78	78	79	80	80
82	71	71	72	73	73	74	75	75	76	77	77	78	79	79
81	70	71	72	72	73	73	74	75	75	76	77	77	78	78
80	70	70	71	72	72	73	73	74	75	75	76	76	77	78
79	69	70	70	71	71	72	73	73	74	74	75	76	76	77
78	69	69	70	70	71	71	72	73	73	74	74	75	75	76
77	68	69	69	70	70	71	71	72	72	73	73	74	74	75
76	68	68	69	69	70	70	71	71	72	72	73	73	74	74
75	67	68	68	68	69	69	70	70	71	71	72	72	73	73
74	67	67	67	68	68	69	69	70	70	70	71	71	72	72
73	66	66	67	67	68	68	68	69	69	70	70	71	71	71
72	65	66	66	67	67	67	68	68	69	69	69	70	70	70
71	65	65	66	66	66	67	67	67	68	68	68	69	69	70
70	64	65	65	65	66	66	66	67	67	67	68	68	68	69

THI = T - (0.55 - (0.55 * (RH/100))) * (T - 58)

Potential Heat Stress Category

Normal < 70	Aware 70-74	Alert 75 - 78	Danger 79 - 83	Emergency > 83