HEAT STRESS CHECKLIST

NOTES

Farm Information

- Map of facility
  - Location of different groups of cows
  - Number of stalls and headlocks per pen

Stocking Density

- **Table 1.** Feedline space, stocking density

	Feedline/Cow	Freestalls (Cows/Stalls)
Close-up or Prefresh	30 in. (76.2 cm)	100%
Fresh Cows	30 in. (76.2 cm)	100%
High Cows	30 in. (76.2 cm)	100%
Mid to Late Lactation	24 – 30 in. (61 – 76.2 cm)	100 – 110%
Far Off Dry	24 – 30 in. (61 – 76.2 cm)	100 – 110%

- Animal density can also be a bottleneck in reducing heat stress. Table 2 demonstrates the impact of 2-Row and 3-Row freestalls per pen at different stocking densities.

- **Table 2.** Effect of stocking rate on space per cow for area, feed and water in pens with 2 or 3 rows of freestalls

Stocking Rate (%)	Area Per Cow ft.^{2} (m^2)		Linear Feedline Space Per Cow in. (cm)		Linear Water Space Per Cow in. (cm)	
	2-Row	3-Row	2-Row	3-Row	2-Row	3-Row
100	94 (8.7)	71 (6.6)	29 (73.7)	18 (45.7)	3.6 (9.1)	2.25 (5.7)
110	85.5 (7.9)	64.5 (6.0)	26 (66.0)	16 (40.6)	3.27 (8.3)	2.05 (5.2)
120	78.3 (7.3)	59.2 (5.5)	24 (61.0)	15 (38.1)	3.0 (7.6)	1.88 (4.8)
130	72.3 (6.7)	54.6 (5.1)	22 (55.9)	14 (35.6)	2.77 (7.0)	1.73 (4.4)
140	67.1 (6.2)	50.7 (4.7)	21 (53.3)	13 (33.0)	2.57 (6.5)	1.66 (4.2)

Water Availability

- 3.6 in./cow (9.1 linear cm/cow) in barn (see Table 2 above)

- All groups of cows
  - Water troughs at exit of milking parlor. Water troughs at entrances tend to hinder cow flow into the holding area. It is preferable to stack them on the return lane, which is when cows are more driven to drink after being milked. Two linear feet of water space per cow per side release (a double 20 parlor releasing 20 cows at a time would need 40 linear feet of water trough space on the return lane. Double 30 parlor = 60 ft., etc.).

Shade

- All groups of cows
- Over the holding pen
- Dry lots 45 ft^2/cow (4.2 m^2/cow)
  - Ideal orientation is north/south
- Shade height = minimum of 14 ft. (4.3 m)

Freestall Ventilation (Natural Ventilation)

NOTE: Fans are not created equal. For independent testing and performance ratings on fans go to http://bess.illinois.edu/index2.htm or http://bess.illinois.edu/

- Minimum side wall height of 14 ft. (4.3 m)
- Ridge row opening 2 in./10 ft. (5 cm/3 m) of building width
- Roof pitch 4/12
- Orientation east/west
- Fans over feedline and stalls
- Fan spacing:
  - 36 in. = 20 ft. (91 cm = 6.1 m); 48 in. = 40 ft. (122 cm = 12.2 m)
  - Not more than 10 times fan diameter
- Fan height and angle
  - 6.6 to 7.9 ft. (2 to 2.4 m) to the bottom of the fan
    - Check local OSHA regulations. In some states fans mounted this low will require blade cages
  - Angle adjusted to maximize airflow over the cows' backs lying in the stall
- Turn fans on at 68° F (20° C)

Freestalls (Mechanically Ventilated)

- Cross or tunnel ventilation?
- Air exchanges per minute (ideally, it should not take more than two minutes to exchange the air in the barn)
  - Total building volume/2 = Total CFM needed for two-minute air exchange
  - One fan will move approximately 25,000 CFM
  - Number of fans x 25,000 = Total CFM
  - When verifying CFM performance, look at the ratings at .10 SP (Static Pressure). Many cross- and tunnel-ventilated barns use 48 – 52 inch fans to achieve the highest CFM per watt of electricity (CFM/watt).

- Wind speed over the stalls should be 7 mph (3.1 m/sec)
- What is the wind speed on the feedline (cow side)?
- How are the fans controlled?
- Is the air cooled as it enters the barn?
- Evaporative pads or high-pressure misters?
- How is the cooling system controlled (manually or mechanically)?
- Is the cooling system set to come on at 68° F (20° C)?
- Are both the cooling system and fans maintained?

Feedline Soakers

The purpose of soakers is to soak the cow to her skin and then have the soakers turn off to allow for evaporative cooling. Soaking a cow that is already wet will provide little additional cooling. The more wet/dry cycles per hour, the more cooling we achieve. The wetting frequency will change due to temperature humidity index (THI), type of soaker nozzle and water pipe diameter. These are some general guidelines:

- Increase wetting frequency with temperature
  - 70° F (21° C) = Every 15 minutes
  - 80° F (27° C) = Every 10 minutes
  - 90° F (32° C) = Every 5 minutes
- On time will be dependent on nozzle size
  - .33 gal per 24 in. of feedline per cycle (1.2 l per 61 cm of feedline per cycle)
- Hang soaker lines as low as possible to get water on the cow with minimal drift

Milking Parlor (Naturally Ventilated)

- Minimum side wall height of 14 ft. (4.3 m)
- Ridge row opening 2 in./10 ft. (5 cm/3 m) of building width
- Roof pitch 4/12
- Fan spacing:
  - Side to side 5.9 to 7.9 ft. (1.8 to 2.4 m)
  - Between rows
    - 36 in. = 20 ft. (91 cm = 6.1 m); 48 in. = 40 ft. (122 cm = 12.2 m)
    - Not more than 10 times fan diameter
- Hang fans as low as possible
- Turn fans on at 68° F (20° C) in the holding pen

- Turn soakers on at 68° F (20° C) in the holding pen
- Soaker system capable of delivering 0.03 gal/ft^2 (1.2 l/m^2) of water in 1.5 minutes or less
- Increase soaking frequency with temperature (same as feedline soakers)
  - Use holding pen temperature
- Exit lane cooling
  - A soaker/drench system that drops water on the cow from above, wetting her back and sides without wetting her udder, which would wash off the teat post dip. This system can be a constant on approach or actuated via an eye beam or wand system as the cow passes the drench/soak area.

Feeds and Feeding Management

- Reduce fermentable energy in ration by using rumen inert fat as a partial substitute for starch
- Minimize rumen degradable protein and maximize rumen undegradable protein to account for reduced starch in the rumen
- Adjust minerals in the DCAD equation such that Cl is minimized (preferable <0.3% of total ration DM) and K is maximized at 1.8 to 2% of total ration DM
  - DCAD should be between 35 and 45, with the higher values yielding a greater mitigating of the effect of heat stress on the animal's biology
  - Dietary Na can be raised to a maximum of 0.8% of total ration DM to adjust DCAD as needed
- Dietary Mg should be between 0.4 and 0.45% of total ration DM.
- Slowly shift feeding schedules such that fresh feed is offered very early in the morning and/or very late in the evening
  - Depending on cooling in the holding pen, milking may be moved to occur during the coolest parts of the morning and evening as well
- Increase frequency of bunk push out/clean out, particularly if feed line soakers are adding moisture to existing feed in bunks
- Depending on the severity of decline in DMI, rations may have to be increased in nutrient density to offset the decline in DMI

This checklist, developed with the assistance of Dr. John Smith, Kansas State University, is not meant to be an exhaustive list of all possible heat stress issues, but to serve as an aid in the investigation of problems and in improving day-to-day management.

NOTES