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# Keeping Cows Cool, Where do I Start?

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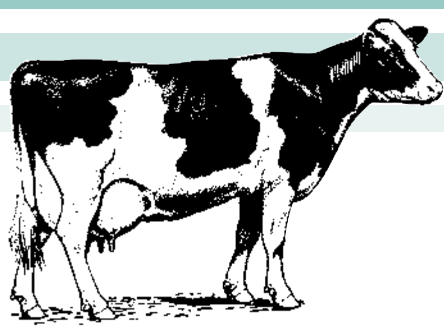

***Heat stress occurs when a dairy cow's heat load is greater than her capacity to lose heat. Heat stress effects include: increased respiration rate, increased water intake, increased sweating, decrease in dry matter intake, slower rate of feed passage, blood flow to internal organs, milk production and poor reproductive performance (Hansen et al., 1992). The lower milk production and reproductive performance cause economic losses to commercial dairy producers.***

### *Water Availability*

Providing access to water during heat stress should be the first step. Lactating dairy cattle will typically require between 35 and 45 gallons of water per day. Studies completed in climatic chambers show that water needs increase 1.2 to 2 times when cows are under heat stress (Beede, 1993). A water system needs to be designed to meet both peak demand and daily needs of the dairy. Making water available to cows leaving the milking parlor will increase water intake by cows during heat stress. Access to an 8-foot water trough is adequate for milking parlors with 25 stalls per side. In warmer climates the following formula is used to calculate the required tank perimeter: group size x .15 x 2 = tank perimeter in feet. In cooler climates, one waterer or 2 feet of tank perimeter is adequate for every 15 to 20 cows. An ideal situation would be to have water available at every crossover in freestall housing with 100 feet between crossovers. (Smith et al., 2000 and Midwest Plan Service, 1997).

### *Shades*

Providing shade in housing areas and the holding pen is the second step. Cows housed in drylot or pasture situations should be provided with solid shade. Florida researchers (Roman-Ponce et al., 1977) found that cows housed with shade had higher milk yields and conception rates than non-shaded cows. Natural shading provided by trees is effective, but most often shades are constructed from solid steel or aluminum. Providing 38 to 48 square feet of solid shade per mature dairy cow is adequate to reduce solar radiation. Shades should be constructed at a height of a least 14 feet with a north-south orientation to prevent wet areas from developing under them (Armstrong, 1993). Using a more porous material like shade cloth or snow fence is not as effective as a solid shade. (Kelly, 1958 and Welchert et al., 1965).

### *Methods to Cool Cows*

Different cooling systems have been tested in a wide variety of climates (Armstrong, 1994, Bray et al., 1994; Brouk et al., 1999; Igono et al., 1987; Lin et al., 1998; Strickland et al., 1989; and Turner et al., 1992). Researchers have tried everything from high-pressure misters to low- pressure sprinklers or soakers to apply water. These have been used along with fan systems to aid in the evaporation of water off the cows' backs and in the surrounding air. As humidity in the environment increases, the ability to evaporate water decreases. In general low-pressure sprinkler or soaker systems can be used to soak the cows along with fans in any climate to cool cows. The effectiveness of these systems can be seen by visiting the local pool on a hot windy day. Children will leave the pool and become cold as the water evaporates off their skin. Just watch these children develop goose bumps as they search for their towels. Once they dry off they become warm and jump back in the pool to start the cycle again.

The same technique is used in cooling dairy cattle by wetting cows intermittently. It must be remembered that high-pressure systems cool the air around the cow, and work best in very arid climates. When low pressure and high-pressure systems are combined, the ability to evaporate moisture off the cows backs may be reduced. Unless a dairy is located in an arid climate, low-pressure systems are probably the most economical and practical way of cooling cows.

### *Holding Pen and Exit Lane Cooling*

The holding pen is where dairy cows experience the most heat stress. Arizona researchers (Wiersma and Armstrong 1983) concluded that when cows were cooled in the holding pen, milk production increased 1.7 pounds per day during the summer. Low-volume sprinklers and fans can be used to wet cows and speed evaporation of the water off the cows backs. Fans should operate continuously providing a minimum of 1,000 CFM per cow. Fans should be mounted overhead and blow downward at a 30 degree angle. Fans of 36- to 48-inches in diameter are most common. Fans are typically placed side by side spaced 6 to 8 feet apart. The distance between rows of fans is 20 feet for 30 and 36-inch fans and 40 feet for 48-inch fans. Water can be sprayed onto the cows using a PVC grid of 360 nozzles. Water is applied one minute out of every six minutes.

Cooling cows as they exit the parlor provides an additional 15 to 25 minutes of cooling per milking (Armstrong, 1993). Typically three to four nozzles are installed in the exit lane, with a delivery of approximately 8 gallons of water per minute at 35 to 40 pounds per square inch. The nozzles are turned on and off with an electric eye or wand switch as the cow passes under the nozzles. If properly installed, sprinkler should wet the top and sides of the cow , the udder will remain dry, the water will not interfere with post-dipping.

### *FreeStalls*

Freestall housing should be constructed to provide good natural ventilation. Sidewalls should be 14 ft high to increase the volume of air in the housing area. The sidewalls should be open 75 to 100 percent. Fresh air should be introduced at the cows' level. Curtains on the sides of freestall barns allow grater flexibility in controlling ventilation. Because warm air rises, steeper sloped roofs provide upward flow of warm air. However, roofs with slopes steeper than a 6/12 pitch prevent incoming air from dropping into the area occupied by the cows. Roofs with slopes less than 4/12 may cause condensation and higher internal temperatures in the summer. Roof slopes for freestall housing should range from 4/12 to 4/16. Providing openings in end walls and alley doors will improve summer ventilation. Gable buildings should have a continuous ridge opening to allow warm air to escape. The ridge opening should be two inches for each 10 feet of building width. Naturally ventilated buildings should be spaced 1.5 to 2 times the building width (Armstrong et al., 1999).

Adding fans and a sprinkler system can provide additional cooling in freestall areas. Freestall bedding must not become wet. Typically, a sprinkler system or soaker system can be located over the lockups, and fans could be used over the freestalls, lockups, or both to aid in the evaporation of water off the cows' backs. Water is applied three minutes out of a 15-minute cycle. These spray and fan systems are turned on and off with a thermostat at 70-75° F (Brouk et al., 1999).

### *Which Groups of Cows Do I Cool First?*

A commonly asked question is which cows should be cooled first? Ideally, all lactating and dry cows should be cooled if possible. All lactating cows will respond to cooling during heat stress. But often producers are faced with the reality that they have a limited budget and have to decide which group of cows to cool. The first group to be cooled should be the close-up cows, those within three weeks of calving. Dry matter intake prior to calving is critical to ensure that the up coming lactation is successful. Remember that we typically loose dry matter intake during heat stress. The second group to be cooled should be the fresh and early lactation cows. These cows are establishing the peak milk production of the lactation. For every pound of peak milk production that is lost, 250 pounds of milk production will be lost over that lactation. It is not uncommon for producers in Kansas to lose 10 pounds of peak milk production during heat stress if cows are not cooled. That is equivalent to 2,500 pounds of milk over the lactation. Once the early lactation cows have been cooled, the mid- and late-lactation cows should be cooled. Here is a list of priorities for reducing heat stress:

1. Supply adequate water.
2. Provide shade in the housing areas (both dry and lactating cows) and holding pen.
3. Reduce walking distance to the parlor.
4. Reduce time in the holding pen.
5. Improve holding pen ventilation and freestall ventilation.
6. Add holding pen cooling and exit lane cooling.
7. Cool close-up cows (those within three weeks of calving).
8. Cool fresh cow and early-lactation cow housing.
9. Cool mid and late lactation cow housing.

Starting with the basics and working overtime to cool all the cows on your dairy will pay big dividends.

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