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Keeping cows cool

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Abstract

Heat stress occurs when a dairy cow's internal heat load is greater than her capacity to lose unwanted heat to the environment. Effects of heat stress include: increased respiration rate, increased water intake, increased sweating, decreased dry matter intake, slower rate of feed passage, decreased blood flow to internal organs, decreased milk production, and poor reproductive performance. Lower milk production and reproductive performance cause economic losses to dairy producers. The ordered priorities for reducing heat are: increasing water availability; providing shade in the housing areas (both dry and lactating cows) and holding pen; reducing walking distance to the parlor; reducing time in the holding pen; improving holding pen ventilation and freestall ventilation; adding cooling for the holding pen and exit lane; cooling close-up cows (3 wk before calving); cooling housing for fresh and earlylactation cows; and cooling housing for midand late-lactation cows.; Dairy Day, 2000, Kansas State University, Manhattan, KS, 2000;

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KEEPING COWS COOL

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Summary

Heat stress occurs when a dairy cow's internal heat load is greater than her capacity to lose unwanted heat to the environment. Effects of heat stress include: increased respiration rate, increased water intake, increased sweating, decreased dry matter intake, slower rate of feed passage, decreased blood flow to internal organs, decreased milk production, and poor reproductive performance. Lower milk production and reproductive performance cause economic losses to dairy producers. The ordered priorities for reducing heat are: increasing water availability; providing shade in the housing areas (both dry and lactating cows) and holding pen; reducing walking distance to the parlor; reducing time in the holding pen; improving holding pen ventilation and freestall ventilation; adding cooling for the holding pen and exit lane; cooling close-up cows (3 wk before calving); cooling housing for fresh and early-lactation cows; and cooling housing for mid- and late-lactation cows.

(Key Words: Heat Stress, Cooling Techniques.)

Water Availability

Providing access to water during heat stress should be the first step. Lactating dairy cattle typically require between 35 and 45 gallons of water per day. Studies done in climatic chambers indicate that water needs increase 1.2 to 2 times when cows are under heat stress. 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-ft water trough is adequate for milking parlors with #25 stalls per side. When using dry-lot housing, we recommend placing water troughs at two locations using the following formula to calculate the required tank perimeter. Group size × 0.15 × 2 = tank perimeter in feet. In freestall housing, one waterer or 2 ft of tank perimeter is adequate for every 15 to 20 cows. An ideal situation would be to have water available at every crossover between feed and resting areas. A minimum of two watering locations per pen is needed.

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 found that cows housed with shade produced more milk and had greater conception rates than nonshaded cows. Natural shading provided by trees is effective, but most often shades are constructed from solid steel or aluminum. Providing 38 to 48 sq ft of solid shade per mature dairy cow is adequate to reduce solar radiation. Shades should be constructed at a height of a least 14 ft with a north-south orientation to prevent wet areas from developing under them. More porous materials such as shade cloth or snow fence are not as effective as solid shades.

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Methods to Cool Cows

Several trials have evaluated different cooling systems in a wide variety of climates. Everything from high-pressure misters to low- pressure sprinklers or soakers have been used to apply water to cows along with fan systems to aid in the evaporation of water off the cow's back or out of the air around the cow. As humidity increases in the environment, the ability to evaporate water decreases. In general, low-pressure sprinkler or soaker systems to wet cows along with fans can be used in any climate to cool cows. We can witness the effectiveness of these systems by visiting the local pool on a hot windy day. The 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 same cycle again. The same technique is used in cooling dairy cattle by wetting cows intermittently. Remember that high-pressure systems cool the air around the cow and work best in very arid climates. When we combine low-pressure and high-pressure systems, we run the risk of reducing the ability to evaporate moisture off the cows' back. Unless you are producing milk in an arid climate, a low-pressure system is probably the most economical and practical way to cool cows.

Holding Pen and Exit Lane Cooling

The holding pen is where dairy cows probably experience the most heat stress. Arizona researchers concluded that when cows were cooled in the holding pen, milk production was increased 1.7 pounds per day during the summer. To make this improvement, low-volume sprinklers are used to wet cows, and fans are used to hasten evaporation of the water off their backs. Fans should be operated continuously providing a minimum of 1,000 cu ft per cow. Fans should be mounted overhead at a 30° angle from vertical, so that the air will blow downward. Fans of 36- to 48-inch diameter used are most commonly. Fans typically are spaced 6 to 8 ft side-to-side. The distances between rows of fans are 20 ft for 30- and 36-inch fans and 40 ft for 48-inch fans. Water can be sprayed onto the cows using a PVC grid of 360° nozzles. Water is applied for 1 min every 6 min.

Cows can be cooled as they exit the parlor to provide an additional 15 to 25 min of cooling per milking. 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 PSI. The nozzles are turned on and off with an electric eye or wand switch as the cow passes under the nozzles. If properly installed, nozzles will wet the top and sides of the cow, but the udder will remain dry so water does not wash off postmilking teat dips.

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. They should be 75 to 100% open. Fresh air should be introduced at the cow's level. Curtains on the sides of freestall barns allow greater 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 improves summer ventilation. Gable buildings should have a continuous ridge opening to allow warm air to escape. The ridge opening should be 2 inches for each 10 ft of building width. The distance between naturally ventilated buildings should be a minimum of 1.5 to 2 times the building width.

Adding fans and a sprinkler system provides additional cooling in freestall areas. Freestall bedding must not become wet. Typically, a sprinkler system or soaker system can be located over the feed-line lockups. Fans can be used over the freestalls, lockups, or both to increase evaporation of

water off the cow's back. Water is applied for 3 min every 15 min. These spray and fan systems can be turned on and off with a thermostat set at 70 to 75°F.

Which Groups of Cows Do I Cool First?

A commonly asked question is which cows should be cooled first? The short answer is that all lactating and dry cows should be cooled, if possible. All lactating cows will respond to cooling during heat stress. With a limited budget, a choice of which group of cows to cool is required. The first group to cool should be the close-up cows. Dry matter intake before calving is critical to ensure that the upcoming lactation is successful. Cows consume less dry matter during heat stress. The second group to be cooled should be the fresh and early-lactation cows. These cows are approaching their peak daily milk production. For every pound of peak daily milk yield that is lost, 250 pounds of milk production will be lost over the entire lactation. It is not uncommon for producers in Kansas to lose 10 pounds of peak milk yield during heat stress when cows are not cooled. That is equivalent to 2500 pounds of milk over the lactation. Once early-lactation cows have been cooled, the mid- and late-lactation cows should be cooled.

Where Do I Start?

With a limited budget, start with step 1 and proceed through step 9: 1) increasing water availability; 2) providing shade in housing areas of dry and lactating cows and in the holding pen; 3) reducing walking distances to the parlor; 4) reducing time in the holding pen; 5) improving ventilation in the holding pen and freestall area; 6) adding cooling systems in the holding pen and its exit lanes; 7) cooling close-up cows during 3 wk before expected calving date; 8) cooling fresh cows and those in early lactation; and 9) cooling mid- and late-lactation cows. Starting with the basics and working over time to cool all the cows on your dairy will pay big dividends. Good luck keeping your cows cool during summer!