



Dairy Extension

Educating the dairy industry on today's and tomorrow's dairy technologies.

Tips for Keeping Dairy Cows Cool

Introduction

High temperatures and humidity put stress on dairy cows. Dairy cows suffer from heat stress at lower temperatures than humans. If a dairy producer is starting to feel the heat and humidity, then the milking cow is already under stress. According to the *Temperature Humidity Index for Dairy Cows* (see table below), if the temperature is 95°F and the humidity is 75% humidity the cow is under “severe” stress.

Temperature Humidity Index (THI) for Dairy Cows*

F	RELATIVE HUMIDITY														Stress level
	40	45	50	55	60	65	70	75	80	85	90	95	100		
75	No Stress				72	72	73	73	74	74	75	75	Mild		
80	73	73	74	74	75	76	76	77	78	78	79	79	80		
85	76	77	78	78	79	80	81	81	82	83	84	84	85	Med.	
90	79	80	81	82	83	84	85	86	86	87	88	89	90		
95	83	84	85	86	87	88	89	90	91	92	93	94	95	Severe	
100	86	87	88	90	91	92	93	94	95	97	98	99			
105	89	91	92	93	95	96	97								

* Modified from Dr. Frank Wierama (1990), Department of Ag. Engineering, University of Arizona, Tucson, AZ.

The ideal ambient temperature for a dairy cow is between 41° and 77°F. High humidity levels, low air velocities, and solar radiation on sunny days contribute to heat stress. Cows are stressed when their respiration rate rises above 75-80 breaths per minute. Cows that suffer from heat stress have reduced feed intake and milk production. Higher producing cows are especially susceptible to heat stress. Pregnancy rates of dairy cows decrease sharply when air temperature exceeds 85°F.

Management Strategies

There are two main management strategies to minimize the effects of heat stress. They are modification of the cow's environment and nutritional management practices. Diet has less impact than cooling cows, but dietary changes will help cows cope with heat stress.

Modifying the Cow's Environment –

- *Prevent overcrowding.* Overstocking freestall barns increases the amount of heat that must be removed. Crowding reduces airflow past the cows, which reduces their ability to get rid of heat.
- *Holding pen and exit lane.* Limit the time cows spend in the holding pen to no more than 45-60 minutes. Use a combination of low volume sprinklers (7-10 gal/hr at 125-150 psi) to wet the cows and 36 - 48 in. fans that provide a minimum of 1,000 CFM per cow. Fans should be mounted from the ceiling angled downward at 30 degrees towards the cows to hasten evaporation of the water. Cooling cows as they exit the parlor provides additional cooling minutes per milking.
- *Free-stall barns.* Sprinkling (not misting) the cow to fully wet her body and using fans to evaporate the water cools the cow and encourages greater feed intake and milk production. Install mixing fans at a height of about 12 ft (to allow equipment for scrapping and bedding stalls to go under them) and angled downward at about 20 degrees. The goal is to create air velocities around 400 to 600 ft per minute across the cow's back when temperatures are 75°F and above. The recommended distance between fans is 30 ft for 3-ft diameter fans and 40 ft for 4-ft diameter fans. Use an interval timer to run the sprinklers for 1-2 minutes per 15 minutes. Use low water pressure (about 10 psi) to produce large water droplets. The goal is to soak a cow's hair coat to the skin, but not wet the udders. Place sprinklers (approximately 8 ft apart with 150-180 degree nozzles to prevent feed wetness and spoilage) and fans next to the feedbunk so that the feeding area is the coolest place on the farm. Do not allow water to be blown into freestalls, which creates a mastitis

hazard. Providing openings in end walls and alley doors will improve summer ventilation for curtain sided barns as well.

- *Tie-stall barn.* The minimum hot weather ventilation rate is 500 cubic ft per minute per cow. Fresh air inlets must be evenly distributed around the barn and sized according to the amount of airflow required. Mixing fans create a draft across or past a cow that helps remove heat from her. However, these fans will not provide air exchanges so they do not really “ventilate” the building. Air exchanges are needed to exhaust the air heated by the cows and to bring in fresh outdoor air. The distance between fans depends on how far the draft from a fan can be felt, but 20 to 25 feet is common.
- *Tunnel Ventilation.* These systems have large exhaust fans located at one end of the barn, drawing the air into the building on the opposite end. It provides both air exchange and airflow past the animals at higher air velocities in the barn during the summer’s hottest days. Although an excellent system, the electrical costs to run the fans can be high. The inlet needs to be sized adequately to handle the airflow. Tunnel ventilation is not used in cold weather so tie-stall barns need a well-designed cold weather ventilation system.
- *Shade.* A portable or temporary shade can reduce the amount of solar radiation that reaches cows on hot sunny days. Shade height should be 14 ft or higher for maximum effectiveness to allow for good airflow under them. Shade cloth is less expensive than solid roofing material but does not provide as much protection from solar radiation. If using a shade structure, feed and water must be available under the shade and a manure management system must be planned. Cows will often lie down in the shade so some of the shaded area should be maintained for good cow comfort.

Nutritional Management –

- *Water* intake increases significantly and higher producing cows may require as much as 50% more water when the THI is above 80. Research shows that cows spend about six hours a day eating, but only five to ten minutes

drinking. Because cows drink mainly after being milked and when fresh feed is offered, water systems must be designed to fit this drinking pattern so water can be delivered to each drinking location at a flowrate to keep up with peak demand. The water should be fresh, clean and free of contaminants as water quality affects consumption. Cows prefer to drink water with a temperature around 70°- 86°F rather than cold water (40°- 60°F). The water supply should deliver at least 3-5 gallons/minute. Cows consume about 6 gallons/hr.

- *Dairy animals will consume more feed during cooler evening hours.* Feeding at sunset and then again about an hour before sunrise are good times. Increase the number of feedings offered per day so the feed will be fresher.
- *Reformulate the diet if dry matter intake declines.* Work with a dairy nutritionist to prepare a ration calculated for cows under heat stress to minimize a drop in milk production. Do not overfeed highly degradable protein (65% or greater) as this increases the heat increment and requires more heat to be dissipated from the animal. Be careful when making dietary changes to avoid creating health or reproductive problems while dealing with heat stress.

Conclusion

Preparations for hot and humid weather should minimize the potential for cows to experience heat stress. Cow comfort should be a priority. Access to cool, clean drinking water should be the first priority. By preparing the dairy facility for hot weather ahead of time and using good management techniques during high temperatures and humidity, the dairy producer can help the herd maintain milk production and cow comfort.

Written by Neil Broadwater, Regional Extension Educator-Dairy on behalf of the University of Minnesota Extension Dairy Team. May, 2005

