Water systems that spray cows with a fine mist offer an economical way to relieve heat stress in San Joaquin Valley dairy herds during 100-degree-plus summer weather.

Manger misting improves dairy cows' appetite

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Misting also decreased losses in milk yield, reduced cow mortality after calving, and improved reproduction.

Misting of corral mangers has been highly cost-effective in improving cow performance during San Joaquin Valley summer heat waves. It is conservatively estimated that more than 100,000 cows in California drylot dairies are provided with misted feeding facilities, and the number increases each summer. The practice is also gaining popularity in Arizona and other southwestern states.

The summer season, from May through September, in the San Joaquin Valley has many days with temperatures over 100°F and has cyclic heat waves lasting from several days to weeks. When under stress from this heat, cows seek and remain in shade, reduce their feed intake, and show an immediate drop in daily milk yield. The conception rate also suffers, and subsequent calving interval is lengthened. Death losses among cows that have recently calved with parturition problems or mastitis are aggravated by the heat. If not for the relatively low daytime humidity averaging 33 percent, the heat-related problems would be compounded further.

Previous observations have shown that the amount and location of corral manger shade can have a beneficial effect on cow eating activities during hot summer months (*California Agriculture,* November-December 1983 and 1985). Physical corral orientation or financial limitations of dairy farmers, however, impede the use of shades over some feeding areas. Misters have offered an economical, easily installed alternative on many dairies.

Mister study

A study in the Tulare milkshed of the San Joaquin Valley during the summers of 1984 and 1985 monitored cow heat stress on 12 farms with corral manger misters and 12 similar unmisted dairies. Mister systems were teed off corral water troughs, and 1-inch, schedule-40 plastic pipe was used for delivery. Misters were suspended 7.5 feet off the ground and above manger stanchions or behind the cows eating in the stanchions, depending on the prevailing breeze. Mister nozzles were 7.5 feet apart with a 5-gallon hourly delivery under 20 pounds per square inch (psi) pressure. The system was thermostat-activated at 91°F and timer-controlled for intervals of five minutes on, five minutes off. All dairies averaged 90 Holstein cows in each corral pen. Cows were milked twice daily and fed similar alfalfa hay, cereal silage, and concentrate rations. All feeding areas were atop concrete-surfaced, gravitational-flow flush lanes.

Based on actual milk tank weights, daily milk loss from misted cows averaged 3 pounds less than from unmisted cows during the heat-stress period. This reduction was more apparent in higher producing animals and during longer heat waves (fig. 1). Comparative production improvement was lower on misted dairies having shade over the manger, but maximum milk drop on extreme stress days was generally halved. Based on milk prices during the time of these observations, mister installation costs were paid back during one prolonged heat wave by milk receipts alone.

Data from the 24 dairies show that misting cows reduced mortality in animals calving within 30 days before the heat-stress period and improved subsequent reproduction parameters (table 1). These results were as important economically as the milk yield response. Based on local market figures at the time of the observations, the value of saving two high-producing, nonpedigreed cows by misting covered the average mister system materials and installation labor costs for a 500-cow dairy. Reports from the University of Florida and University of Arizona suggest that reducing heat stress in dairy cows can improve reproductive hormonal balance as well as reduce the likelihood of early embryonic deaths.

The percentages of misted cows eating for 120 minutes after milking during relatively high afternoon temperature were similar with or without manger shades (fig. 2). In contrast, eating was significantly decreased at unshaded, ummisted mangers when compared with eating at unshaded, but misted mangers (fig. 3). These observations suggest that corral manger misting could be helpful where shade projections may not cover animals at feeding time. The shading of fenceline drylot mangers with a north-south orientation in many instances is effective for only part of the day.

TABLE 1. Effects of manger misting on fresh cows and on reproduction

Item	Misted	Not misted
Fresh cows		
Daily milk, % change	0 (−4)	−8 (−12)
Mortality, % change	0 (0)	+3 (+ 5)
Reproduction		
Services/conception*	2.1	2.5
1st service conception, %*	35	26
3rd service conception, %*	82	72
Average days open*	110	122
Days in milk, % change†	−3	+5

NOTE: Averages of 12 misted and 12 unmisted herds; values in parentheses are from 20-day heat wave.
* 60-day nonreturn conception data.
† Cumulative end-of-summer values.

Angling the mist toward the midbody point of the cow standing at the manger is the most effective pattern. Misters apply up to 11 gallons of water per cow daily.

Other considerations

Misting with the thermostat-activated, timer-controlled system in this study used an average of 11 gallons of water per cow daily with unshaded mangers, 7.7 gallons with partially shaded mangers, and 4.3 gallons with completely shaded facilities. Excess water dripping from cows or free-falling moisture was useful in keeping solids loose for more complete flushing to the recycle lagoon for irrigation. Relative humidity under misted manger shades was increased 10 percent but was of little consequence in the arid conditions of these observations.

Water and pumping costs were negligible during these observations, but minimizing water use can be a concern. Subsequent observations indicate that several variables must be considered in making changes to reduce mister water use. Installing smaller orifice emitters often increases plugging, especially if water has a high mineral content. Drift becomes more of a problem with finer mist. Lowering mister height invites more breakage resulting from cow curiosity. Adjusting thermostat-timer controls or strategic manual operation has proved most successful for some circumstances. Where flush lanes had no curbs or scrape cleaning was done in place of flushing, manual mister volume control appeared more advantageous than automated delivery to control excess water collection.

Cows lying down near misted corral mangers, with or without shade, was not a problem when adjacent shaded lounge area was available. It has been necessary, however, to be sure that improper positioning of manger misters or drifting mist does not cause excessive wetting of the lounge area. Wet bedding material could provoke mastitis and pest problems. A light misting of manger feed can at times be helpful, but excess moisture could reduce feed quality.

Effective misting requires assessment of the individual dairy situation with regard to mister pipeline height, distance to cows, and the prevailing breeze. A high degree of success has resulted from angling the bulk of the mist pattern toward a mid-body point of the cow standing at the manger. Individual dairy farmers have developed unique ideas for positioning misters most effectively. These have included using alleyway fences and roof suspensions, as well as creating elbow-type extensions out over cows from the manger fenceline, to compensate for drift.

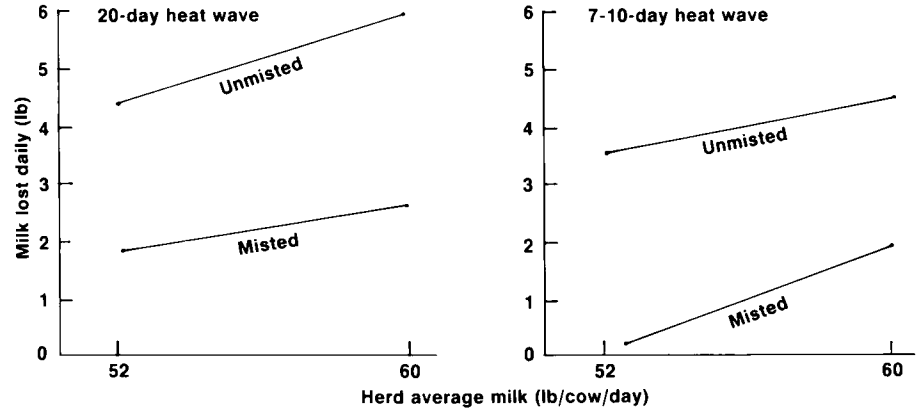

Fig. 1. Heat stress reduced milk yields less when cows were misted. The benefit from misting was greater in higher producing cows and during longer heat waves.

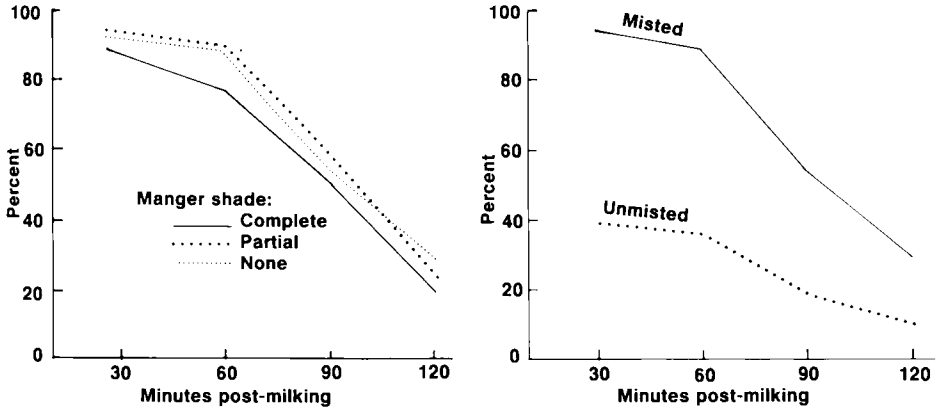

Fig. 2 (left). With misting, manger shades had little effect on percentages of cows eating for 120 minutes after milking during the afternoon. Fig. 3 (right). Misting had a significant effect with unshaded mangers, however, resulting in a lower drop in the percentage of cows eating 120 minutes after milking.

Conclusion

Monitoring cow behavior during heat waves in this misting study showed that animals ate more frequently in the daytime when misted than when nonmisted. A review of the literature suggests that this daytime eating reduces cow dependence on nighttime overeating to meet nutritional needs. Misting cows as they returned from afternoon and early evening milking maximized benefits with a minimum of mister water. These benefits included more apparent appetite for fresh feed and reduced leftover manger feed, as well as the obvious comforting effect during heat stress. In this study, misting decreased losses in milk yield and in mortality of cows that had recently calved, as well as improving reproduction.

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