

Cooling Dry Cows

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The drop in milk production in the summer causes significant economic losses in the dairy industry. That decrease in production is brought on by heat stress, and studies have documented that cooling lactating cows increases their milk production.

Although little research has been conducted on the effects of cooling cows in the dry period, some studies indicate that it can:

- Reduce culling after 10 months of lactation, and
- Increase calf birth weights by as much as 10 percent.

Other studies have investigated whether cooling dry cows affects postpartum milk production and reproductive measures, but the results so far have been inconclusive.

In deciding whether to install cooling systems for dry cattle, producers should consider both the immediate- and long-term effects on production.

Effects of heat stress

Heat stress to cattle is brought on by solar radiation, high air temperatures and high relative



Fans and shade can help alleviate heat stress in cattle, which affects milk production.

humidity. This is further aggravated by heat production from the cow's own body. Generally, the more milk a cow produces, the more heat her body produces from digestion and metabolism.

Cattle respond to heat stress by panting and sweating. If these do not alleviate the heat load, the body temperature will rise, which in turn will reduce feed intake, increase the maintenance requirement (panting can increase this as much as 25 percent) and decrease fertility, immune system function, growth, milk pro-

duction and productive ability.

Cattle under heat stress have higher maintenance requirements, which dictate that they take in more feed to maintain milk production. However, this is not possible, because feed intake declines when air temperatures exceed 68 degrees F. Because of this increase in requirement and decrease in intake, milk production may decline by as much as 30 percent (Table 1); the percentage of milk components may shift; and reproduction efficiency will decline.

To help lessen the heat load on cattle during the summer, producers may adjust both nutrition and management. Nutrition adjustments may include changes in bunk management, feeding schedules and ration composition (increased energy density, use of feed additives such as buffers, potassium carbonate,

Table 1. Effects of heat stress on maintenance requirement, feed intake and milk production.

Temperature (°F)	Maintenance requirement (%)	Projected intake required to maintain milk (DM, pounds)	Actual feed consumed (DM, pounds)	Milk produced (pounds)
68	100	40.1	40.1	59.5
77	104	40.6	39.0	55.1
86	111	41.7	37.3	50.7
95	120	42.8	36.8	39.7
104	132	44.5	22.5	26.5

McDowell et al., 1976. Journal of Dairy Science, 59:965.

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The easiest way for producers to help heat-stressed cattle is to provide shade.

yeast, etc.). Management considerations include installing cooling systems. Although much of the diet adjustment is made with a nutritional consultant, it is typically the dairy producer who decides on the cooling system.

Cooling methods

The objective of any cooling system is to keep the cow's body temperature as close to normal for as much of the day as possible. An acceptable range in rectal temperature is 101.3 to 102.8 degrees F.

The easiest and most obvious way to help heat-stressed cows is to provide shade. Direct sunlight adds a tremendous heat load to the cow and can be blocked by either permanent or temporary shades. In many dry cow pens, shade is limited or not provided at all.

A second step is to provide additional cooling using sprinklers and fans. Sprinkling the cow with water to fully wet her body and using fans to evaporate the water cools her and encourages her to take in more feed and produce more milk.

Research on effects of cooling

Research on lactating cows has documented that cooling them increases their milk production. Studies have also shown that managing nutrition in the

dry period offers carry-over effects on postpartum production. However, little work has been done on the responses of cooling cows in this period.

The dry period is particularly crucial because it involves regeneration of the mammary gland and rapid fetal growth. This is also when follicles begin developing and maturing for the next reproductive cycle. In this period, the cow's metabolic heat load is low in comparison to her ability to dissipate heat, being about half of that of a lactating cow producing 65 pounds of milk.

However, the cow's endocrine system is thought to be more sensitive to moderate heat stress during the dry period than during lactation. Heat stress to the prepartum endocrine system may reduce the concentrations of thyroid hormones and placental estrogen, and increase nonesterified fatty acid (NEFA) levels. These may affect the growth of maternal tissues (mammary gland, placental, or fetal tissue), the function of the mammary glands postpartum and the rate of uterine involution.

Work from the University of Arizona suggests that the primary benefit of prepartum cooling may be that it reduces the number of cows culled open after 10 months of lactation. Studies have also consistently shown that heat stress during the last

trimester of pregnancy decreases calf birth weights, some by as much as 10 percent.

Prepartum heat stress also may reduce colostrum quality. Research on heifers exposed to heat stress prepartum has revealed that the heifers have lower immunoglobulin content and reduced levels of total protein, fat and lactose in the colostrum.

Several groups report that calves born during the summer suck their dams less vigorously and their efficiency in absorbing nutrients may be impaired because of heat stress. This lowered absorption efficiency, coupled with the lowered antibody and nutrient content of colostrum, may increase the incidence of health complications and mortality in calves born in the summer and early fall.

Although studies have been conducted on the effects of prepartum cooling on postpartum milk production, the results have been varied. Reports range from no significant differences (although in both trials, cows cooled prepartum tended to produce more milk than noncooled cows) to an 8-pound increase in 150-day milk production.

Summary

Prepartum heat stress may affect cattle postpartum. Research reports that rectal temperature respiration rate and calf birth weight respond consistently and positively to prepartum cooling. Responses in postpartum milk production and reproductive measures have been variable and are less defined.

Variations in postpartum performance response bring question to the economics of prepartum cooling. Cost:benefit analyses of cooling systems, at any stage of production, need to consider both immediate and long-term effects on production.

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