Texas A&M AgriLife Extension

Texas Dairy Matters

Higher Education Supporting the Industry

NEW TOOL TO COMBAT HEAT STRESS

Ellen Jordan
Extension Dairy Specialist
Department of Animal Science
Texas A&M AgriLife Extension Service
The Texas A&M University System

Every summer we see signs of heat stress as the mercury climbs. We've added fans, shades and soakers; fluctuated the timing of soaking with increasing temperature, and included cooling in the holding pens and for dry cows. We've also changed the way we feed to keep dry matter intake up. Yet most summers dairy farmers still see a decline in milk production.

One area of management that hasn't received much attention is to select dairy cattle based upon increased ability to withstand heat stress. Researchers from the University of Florida, USDA-ARS, and Turkey have been evaluating the "SLICK" gene that appears to make cattle more resistant to heat stress. This gene was first identified in Senepol cattle on St. Croix, a Caribbean island. The enhanced heat stress resistance results from an increased rate of thermal sweating.

Through crossbreeding the gene has been introduced into Holstein cattle. Animals in the study population were products from a series of matings since the 1990s that were at least 15/16 Holstein. Since not all animals received the "SLICK" gene, both slick and normal-hair coat relatives were used in the study. A third group of cows, produced from matings of normal-haired Holsteins, was classified as the “wild-type”.

All studies on variation between the slick, normal and wild-type hair coat animals were conducted at the University of Florida. The freestall barns there are sand-bedded and cooled with fans and shades. The fans operate continuously and sprinklers are on for 1.5 min at 6 minute intervals when the temperature exceeds 70 degrees Fahrenheit. The slick and normal relatives as well as the wild-type cows were selected to be similar based on parity, stage of lactation, and milk yield.

During late July and mid-August, vaginal temperature was measured at 15-minute intervals for three days as an indicator of core body temperature. There were three replicates of this data collection with different cows in each replicate. In a second experiment cows were housed outdoors on concrete with shade cloth, but no sprinklers or fans. With five replicates of one day duration, cows in the slick, normal and wild-type groups had rectal and surface temperatures recorded. In addition respiration rate and sweating rates were measured. A third area evaluated was seasonal variation in milk yield as affected by genotype.

Table 1. Variation in vaginal temperature, rectal temperature and respiration rate for dairy cows possessing the SLICK gene, cows with normal hair coats that are relatives of the SLICK gene cows, and cows from the general Holstein population with the wild-type genetics Dikmen et al. 2014).

Item	Type of Hair Coat		
	Slick	Normal Relative	Wild-Type
Vaginal Temperature	101.3 ± 0.072	102.38 ± 0.09	102.38 ± 0.09
Rectal Temperature	103.28 ± 0.09	104.54 ± 0.04	104.9 ± 0.09
Respiration Rate	93 ± 0.7	101 ± 0.7	107 ± 0.8
Stage of Lactation,			
Vaginal Temperature			
<100 DIM	101.7 ± 0.09	102.9 ± 0.23	103.6 ± 0.22

100-200 DIM	101.1 ± 0.09	102.4 ± 0.11	101.8 ± 0.11
> 200 DIM	101.1 ± 0.09	101.7 ± 0.09	101.7 ± 0.07

As illustrated in Table 1, both vaginal and rectal temperatures were lower in the animals possessing the SLICK gene. There were some differences in vaginal temperature at various stages of lactation, with the cattle with the SLICK gene having reduced effects.

There was a tendency ($P = 0.08$) for sweating rate to be affected by genetic type. Sweating rate was higher for slick cows than for their normal coat relatives or the wild-type cows. An interaction occurred between genetic type, season of calving, and days in milk. Slick cows that calved during the summer had smaller decreases in milk yield than the other groups.

It is evident that cattle with the slick hair phenotype have the ability to regulate their body temperature. This improved resistance to heat stress resulted in milk production sustainment. This research indicates that in addition to manipulating the environment to mitigate the effects of heat stress, incorporating alternative genetic material, such as the SLICK gene, through special mating provides another opportunity to mitigate heat stress. The resultant offspring with the SLICK gene are then another tool in the battle against heat stress.