The Nutritional CONSULTANT'S DIGEST Volume 26

Feed "A Cool Fat to a Hot Cow!"

Heat stress negatively impacts the dairy industry, primarily in lost milk production, and is a significant financial burden in many dairy-producing areas of the world. Heat stress leads to reduced feed intake, a reduction in rumination and nutrient absorption, and increased maintenance requirements.[1,4,7] These factors result in a net decrease in nutrient/energy availability for milk production, and culminate in a majority of lactating cows entering into negative energy balance.[10]

Dietary strategies to alleviate this energy deficit traditionally include increasing the energy density of the diet with either concentrates or fats.[2,3,5] This is necessary to account for the decreased feed intake and increased maintenance requirements. However, high-concentrate diets or addition of oils rich in unsaturated fatty acids to rations can adversely affect rumen health.[6] Saturated free fatty acid (SFFA) supplementation may be particularly important in this scenario because this energy source does not negatively affect rumen fermentation. The high caloric value of SFFA and its low heat increment can help reduce the energy deficit.

Knapp and Grummer found that heat-stressed, early lactation cows fed 5% supplemental fat (3% Energy Booster 100® and 2% tallow) produced more milk and milk fat than those fed no additional fat.[5] Other experiments on the effects of fat supplementation during heat stress have shown trends for increased milk production[8] or increased feed efficiency (FCM/DMI).[2]

A recent experiment determined the effects of SFFA (Energy Booster 100®) on heat stress measures and lactation performance of mid-lactation dairy cows already experiencing heat stress.[9] Scientists assigned forty-eight Holstein dairy cows in mid lactation to one of three treatments: 0, 1.5 or 3.0% supplemental SFFA (1.54, 1.60, and 1.67 Mcal NE_L/ kg DM, respectively). Cows experienced heat stress at the beginning and throughout the entire experiment, according to the temperature-humidity index (THI; min = 64.2, max = 97.3, mean = 76.6).

SFFA in the diet alleviated the increase in body temperature observed at 1400 h with cows fed 0% SFFA (Table 1). Dry matter intake, body condition score, and respiration were not affected by treatment. Milk production increased by approximately 2 kg/d (4.4 lb/d) with SFFA compared with no added fat (Table 1).

However, there was no additional increase in milk production between fat treatments. This may be due to the cows reaching the maximal allowable milk production because of genetics, allowable protein in the diet, or other management factors. Milk fat percentage and yield increased with supplemental SFFA (Table 1). Based on the research, the key to keeping cows producing milk and milk fat in the heat is to provide an energy-dense diet that does not reduce DMI or adversely affect rumen health. Energy Booster 100®, a highly palatable fat source, is "a cool fat for a hot cow!"

Table 1. Effect of supplemental saturated fat on heat stress measures taken at 1400 h and production measures.[9]

	Supplemental Saturated FFAs (% DM)		
	0	1.5	3.0
Heat Stress Measures, 1400 h			
Rectal temperature (°C)	40.0[a]	39.0[b]	39.2[b]
Respiration rate (bpm)	65	67	67
Production Measures			
DMI (kg/d)	20.1	20.1	20.2
Milk Production (kg/d)	26.4[a]	28.5[b]	28.6[b]
Milk Fat (%)	3.39[a]	3.67[ab]	3.81[b]
Milk Fat (g/d)	896[a]	1066[b]	1089[b]
Milk Protein (%)	3.06	2.92	3.07
Milk Protein (g/d)	800	843	863
BCS	2.73	2.71	2.72

[a,b] Values with different superscripts in the same row indicate significance at $P < 0.05$.

Fat Fast Facts

- Cows need more energy-dense diets during heat stress due to decreased feed intake and increased maintenance requirements.
- Cows fed Energy Booster 100® did not experience increases in body temperature during the hottest time of the day.
- Utilizing dietary fat supplements high in SFFA improves milk and milk fat production during heat stress.
- Energy Booster 100® is a highly palatable energy source shown to maintain dry matter intake.

[1]Beede and Collier, 1986. [2]Chan et al., 1997. [3]Drackley et al., 2003. [4]Gaughan et al., 2008. [5]Knapp and Grummer, 1991. [6]Maia et al., 2007. [7]NRC, 2001. [8]Skaar et al., 1989. [9]Wang et al., 2008. [10]Wheelock et al., 2006

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