Managing heat stress in dairy cows

By: Brad Clyburn Ph D.
Chr. Hansen Animal Health & Nutrition

Reduced dry matter intake (DMI) has a financial impact on milk production and when cows are heat stressed they will tend to eat less often and more at each feeding, which can lead to acidosis. Dr. Lance Baumgard (Innovations, April 2007, Iowa State University) had the following comments on how significant heat stress can be on the disruption of a cow’s normal feeding pattern:

“A disruption in feeding patterns is very significant for several reasons.

• First you’ll see a reduction in feed intake, which is a natural mechanism designed to reduce the cow’s metabolic heat.

• You’ll see her feeding in bouts (during the cool evening), and this may alter her lactic acid production.

• Reduced rumination means less saliva production and therefore, less buffering capacity in the rumen.

• Drooling also reduces the amount of high quality saliva used in buffering as well.

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All these factors can put her at an increased risk of developing rumen acidosis.

When asked to further explain the physiological effect behind these observations, Dr. Baumgard responded with the following comments: “The increased respiration also increases the amount of CO₂ expired. To compensate, the kidney dumps HCO₃⁻, which is required to buffer the rumen. Combined with the loss of saliva the potential for rumen acidosis increases greatly. Our research has also shown that the heat stressed cow becomes hypersensitive to insulin and has decreased NEFA levels along with an increase in glucose disposal. The cow appears to preferentially burn glucose because that may create less metabolic heat (up to 13% less) than burning fatty acids, which is normal when she has reduced feed intake. Heat stressed cows require extra energy however, especially from glucose which is now in short supply. Ultimately she ends up with less glucose going to the mammary gland from the liver, which reduces lactose production. It’s like “survival mode” for the cow, in that she partitions her nutrients in a different way. Therefore, nutritional strategies to increase ruminal propionate production and liver glucose output or reduce sensitivity to insulin are very important.”

When asked if a DFM like Probios® Precise fed cows have increased DMI and a more stable rumen environment.

The scientific literature suggests that Probios® Precise fed cows have increased DMI and a more stable rumen environment.

In North America, heat stress is a significant cow health issue with economic consequences. The combination of lost milk and components, poor reproductive performance, rumen acidosis, increased health care costs and reduced heifer growth rates can have a significant financial impact on the dairy.

Ambient temperature is well known to affect milk production, and its effect is compounded by relative humidity. A better predictor of whether a cow is adversely affected by heat is the temperature-humidity index (THI), which is a combination of relative humidity and ambient temperature.

A cow shows signs of heat stress when the THI is as low as 68 (Zimbelman et al., 2009). Productivity can start to decrease with mild to moderate heat stress when observed THI levels are between 72 and 79. When relative humidity is high, this point can be achieved at moderate temperatures (see THI chart).

Individual cows can be affected differently by heat stress. For instance, higher-producing cows are more likely to exhibit signs of heat stress than lower-producing cows because higher-producing cows generate more heat as they consume more feed for higher levels of production. Dairy cows have a need to dissipate extra heat generated as a result of metabolizing more nutrients from feed. Approximately two pounds of milk production is lost for every pound of decreased dry matter intake when temperature and humidity levels are high (Pennington and Van Devender 2011).

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<tr>
<th>Temperature</th>
<th>% Relative Humidity</th>
<th>THI</th>
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<tbody>
<tr>
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<td>20%</td>
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Effect of DFM in Probios® Precise on Dry Matter Intake

environment. During heat-stress this should minimize the negative effects of heat stress on production and help maintain a healthy rumen.”

The ingredients in Probios® Precise and Probios® Complete have been shown through research and field observations to decrease fecal starch with rations containing moderate to high levels of starch (>25% DM basis). Additionally, research feeding Probios® brand DFMs demonstrates improved digestion, feed utilization and dry matter intake (Nocek et al., 2002; Nocek et. al., 2003; and Nocek and Kautz 2006).

References:
Nocek et. al., 2002, JDS 85:429-433
Nocek et. al., 2003, JDS 86:331-335
Nocek and Kautz 2006, JDS 89:260-266