# Heat Stress 2011: Practical lessons learned - A survey of Minnesota dairy farm heat abatement practices and resulting production responses.

Kohls, D.[1], Kuehn, C.[1], Groen, B.[1], Lahr, D.[1], Baumgard, L.[2]

## Background:

The record-setting heat wave of July 13-21, 2011 markedly decreased milk production, severely compromised animal health and unprecedentedly increased livestock mortality, and is likely the most extreme weather event experienced by Midwestern livestock producers in modern history. First District Association[3] (FDA) cooperative creamery dairy patrons reported an average acute drop in milk production of -20.19% by July 23, 2011 (compared to their July 1, 2011 benchmark). By August 31 the typical FDA patron had still not fully recovered, with farms still -5.11% lower than the July 1, 2011 benchmark. A cooperative effort between Form-A-Feed, Inc.[1] (FAF) and FDA was initiated to conduct a retrospective survey of 206 qualified FDA dairy patrons. The objective of the survey was to compare the actual milk production responses to this specific heat stress event with housing, heat abatement and relevant nutrition practices in an attempt to identify general management practices associated with the magnitude of response.

The survey consisted of 44 questions regarding housing type and relevant, commonly practiced heat abatement and nutritional management strategies. Along with lactating and dry cow housing type, these six main areas of concern were addressed based on the FAF Dairy Heat Stress Risk Snapshot©[1]: 1.)monitoring systems, 2.)drinking water, 3.)air and ventilation, 4.) evaporative cooling, 5.)shade and cow comfort and 6.) nutritional and metabolic management practices. Results were compiled and analyzed utilizing two statistical models to evaluate the use of each questioned heat abatement practice (or absence of) for milk drop to the acute heat stress event and subsequent milk recovery, each as an independent variable. Surveyed herds were allocated into High Drop(HD=>-10% acute drop in milk production), Low Drop(LD=<-10% acute drop in milk production) and High Recovery(HR= >-5% Aug 31st milk production relative to July 1st benchmark), Low Recovery(LR=<-5% Aug 31st milk production relative to July 1st benchmark).

## Survey Highlights: The most significant differences in heat abatement practices

### Monitoring Systems:

The ability for herds to measure both day-to-day bulk tank milk yield and assessing cow body temperature were moderate indicators of success for both milk drop and recovery. The use of dairy management software, tracking daily bulk tank milk yield, dry matter intake, and daily water usage with a water meter all related to above average success in milk recovery.

### Drinking Water:

Herds that had conducted a drinking water test within the last two years had a 3.76% net advantage in milk recovery compared to herds that had not ($p<0.04$). An assumption could be made that herds testing their water at the very least monitored water quality more closely, and were more likely to take action in that management area.

### Air & Ventilation:

Wind speeds of 5± miles per hour (mph) over the resting area of cows was one of the most significant factors for both milk drop (2.94%, $p<0.03$) and milk recovery (3.87%, $p<0.03$). It was one of the most significant differentiating factors between HD and LD herds ($p<0.04$). This was especially true in tie stall barns, where combining wind with sprinklers is not always applicable or achievable.

### Evaporative Cooling:

Combining air movement with sprinklers was very significant for milk drop (3.97% difference, $p<0.04$), and HR herds combining these practices outnumbered LR herds by a 3:1 margin ($p<0.03$). Simply using sprinklers or soakers for evaporative cooling was the highest ranking differentiating practice between HR and LR herds by a 4:1 margin ($p<0.001$). This is a significant advantage of the Freestall housing type. Keeping these systems well maintained also produced large numeric advantages in milk production (6.2% recovery difference, $p<0.09$). While there was a limited number of high pressure-mist or evaporative pad-cooled barns in the survey, these few herds suffered numerically higher milk drop during the acute phase of the heat stress event than barns using sprinkler/soakers, but tended to recover well following July 23rd. This may have indicated that air was too completely saturated to provide adequate cow cooling with the high humidity and dew points experienced with this event.

[1]*Form-A-Feed, Inc., Stewart, MN.* [2]*Iowa State University, Ames, IA.* [3]*First District Association, Litchfield, MN.*

**Shade & Cow Comfort:**
*Stocking density was the number-one factor related to milk recovery*. Herds that maintained stocking densities at or below recommended thresholds for their housing type had an 8.73% (p<0.003) advantage in milk recovery, in addition to an 5.39% (p<0.13) advantage in milk drop. Nearly all surveyed herds provided both shade and fly control for cows, so while they did not make the list of most significant survey results, it is intuitive that they are necessary management tools in successful heat abatement programs.

**Nutrition & Metabolism:**
The use of Sweet Energy[1,3] or FAF Sweet Dairy Liquid[1] sugar blends (significant sources of dietary sugar and macrominerals) in everyday ration formulations was the number-one related success-factor to milk drop (4.9% milk advantage, p<0.02) and the second ranked related success-factor for milk recovery (7.91% diff, p<0.004). Furthermore, herds that strategically initiated the use of Hydro-Lac®[1], a patented timed-event nutrition (TEN™)[1] product, were more than twice as persistent during this period compared to non-users (p<0.05). Other strong trending nutritional or metabolic practices for positive milk recovery included the everyday use of ionophores, direct-fed microbials, yeast cultures and the use of rBST. However, these practices did not make the list of top practices for milk drop.

Most of the surveyed herds indicated the use of buffers or DCAD balancing in their summer rations. Because of this, these did not factor in the results of this particular survey as significantly different. However, there is much data to support their use in daily rations of lactating cows, similar to the survey results for shade and fly control.

**Housing Type:**
Tie stall barns suffered the greatest acute loss in milk production (-17.78%, p<0.08) compared to Freestall(-15.19%), Compost/Bed Pack (-13.67%), or Open Lot/Grazing (-12.71%). However, Open Lot/Grazing herds failed to recover (-12.98%, p< 0.18) as of August 31st compared to Freestall (-3.94%), Compost/Bed-Pack (-3.68%), or Tie stall (-6.00%) housed herds. When comparing lactating cow housing types against each other, Freestall herds (27 HR vs. 10 LR herds) were nearly three-times more likely to recover to within -5% of July 1st milk production than Tie stall housed-herds (75 HR vs. 72 LR herds, p<0.02).

In 106 survey herds that shared DHIA data, it is also noteworthy that pre-fresh dry cows housed in Tie stall barns were at nine-times greater risk for death loss in August when compared to other housing types for pre-fresh cows (3.60 vs. 0.42%, p<0.001). This same trend continued through October at four-times the risk (2.55 vs. 0.63%, p<0.01). When culling data was added to death rate, pre-fresh cows housed in Tie Stall barns were ten-, three-, and four-times more likely to leave the herd compared to other housing types during July, August and September 2011, respectively (p<0.0001, p<0.02, p<0.0004). Future evaluation of this data will include reproductive, cull rate and death rate relationships with each of these independent heat abatement practices in addition to housing type.

## Summary: The importance of comprehensive, multiple approach heat abatement practices

Along with housing type, the survey clearly illustrates the importance of addressing each of the six above named areas of concern with regard to heat abatement. Herds that succeeded in addressing all six areas minimized milk drop and succeeded in the best ultimate recovery in milk production. Specifically per this survey, these most important differentiating heat abatement practices included, and are not limited to:

- *having monitoring systems in place to track and respond to change, such as heat stress*
- *testing and monitoring drinking water quality and ensuring adequate access and intake*
- *managing stocking density appropriate for housing type, avoiding overstocking*
- *use of and proper maintenance of sprinklers and soakers for evaporative cooling*
- *wind speeds of 5± mph over the resting areas of cows*
- *use of Sweet Energy/Sweet Dairy Liquid sugar blends in daily ration formulations*
- *strategic use of Hydro-Lac® for TEN™ support of milk production, recovery and animal health*

The survey also revealed that much more can be done to influence recovery from a heat stress event than to prevent acute milk drop with regard to a severe heat stress event such as this. Future evaluation of this data will include a review of reproductive, cull rate and death rate relationships with each of these independent heat abatement practices.

*For more information, contact Form-A-Feed, Inc., Stewart, MN Ph. 1-800-422-3649 www.formafeed.com*