Beat the Heat with Genetics

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It’s that time of year again – for backyard barbeques and family picnics. But along with the warm weather also comes longer days in the field and more time in the barn managing health events and tackling decreases in fertility and production. While we might enjoy a few hot and sunny summer days, our cows certainly do not!

Higher milk production equals higher metabolic heat

Heat stress in dairy cows has become more apparent overtime. Producing milk is a metabolic process that results in internal heat being generated by the animal. As we select for higher producing cows, we also select for cows that have greater metabolic heat. While economically this is beneficial, increasing the cow's internal heat production overtime means that she is less able to deal with the heat outside.

Outside of a comfortable temperature range, either too hot or too cold, a cow will struggle to maintain their optimal health and production. Cows are most comfortable between 5ºC and 20ºC, but this can vary depending on the humidity. The temperature-humidity index (THI) combines both factors that determine heat conditions into a single number. A THI of 70 could be 27 ºC at 15% humidity or 23 ºC at 70% humidity. For dairy cows, we start to see a decrease in production, fertility and health at THI of 60 or 17 ºC at 52% humidity.

We can't control the weather, so we need to make sure we are doing everything possible to make the environment better for the cows. We're great at finding management solutions to help beat the heat. You can find full details for ways you can prepare for the summer at https://lactanet.ca/en/thematique/thermal-stress/. These strategies include feed management and installing cooling equipment, but what about genetics?

Should we be adding breeding to our heat management toolkits?

Breeding values for heat tolerance are already available in some parts the world, especially in areas that experience extreme heat year-round. In 2018, Australia released the heat tolerance breeding values that allow farmers to identify animals with a greater ability to tolerate hot conditions

and less impact on milk production. To do this, they matched weather station data with individual cow production records and measured the change in milk, fat and protein around the time of heat events. In Australia, selecting for heat tolerance has led to higher summer milk production, improved animal health and welfare, increased conception rates, reduced embryo loss, and higher calf birth weights.

But what about in Canada?

Research is already underway to answer that question. We are also matching weather station and production data to measure the impact of heat stress on-farm, and you might be surprised by the answer. Although we think of Canada as a cold country, studies in Quebec have shown that we might not be as cold as we think– at least not from the cow's point of view.

In Canada the average number of days exceeding the comfort zone for cows is 117 days – almost 1/3 of the year. The economic losses for the Canadian dairy industry arising solely from reduced production due to heat stress were estimated in $42.4 million per year. This doesn't account for decreases in fertility or health! We also know that some production traits are affected at different THI. Milk production begins to decrease at THI of 64, but milk components are impacted at much lower THI. Protein yields begin to drop at THI of 58, while fat yield is impacted at THI as low as 50. Researchers are still looking at thresholds for other traits, like fertility, and in other stages of the animal's life as a calf and dry cow.

While our housing system allows for more management tools to be implemented compared to pastoral systems, the temperature inside the barn is commonly 10ºC warmer than the conditions outside, especially if stocking density is at its maximum. This increases the number of days those cows are actually experiencing heat stress.

One of our goals for the future is to breed for a more resilient dairy cow

and heat tolerance may be one characteristic of that resilient cows. We want cows that are able to bounce back from any stressful event – health, reproduction or environment.

“When heat waves hit, heat tolerance can take two forms – cows that can recover more quickly from heat stress or cows that can cope better with high temperatures.” says Ivan Campos, a PhD candidate at the University of Guelph exploring climate resilience as a compelling strategy to prepare our industry for changing environments.

Can we breed for more climate resilient cows?

Looking further into the genetic mechanisms behind heat tolerance and climate resilience is one way we’re ensuring that Lactanet delivers the most innovative genetic tools to Canadian dairy farmers. As world leaders in dairy genetics, we continue to develop new strategies and products that farmers can use to tackle future industry challenges – in a world that keeps getting warmer.

By Caeli Richardson