Beyond Calving

Intergenerational Impacts of Heat Stress and the Slick Advantage

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An extremely hot day can be hard on any cow. The heavy breathing, the hunt for shade, the feed left in the trough, and the drop in milk that follows are all easy to spot. But what if the real damage from heat stress isn't the milk we lose today, but the hidden changes it causes that we don't see? Heat may not only affect the cow herself, but it may also carry through to her calf, influencing its growth, health, and even its ability to produce milk in the future.

In the December 2024 issue of Northern Horizons, Dr. Dannylo Sousa wrote about the hidden effects of heat stress before calving. He explained that dry cows exposed to high temperatures can start losing production potential well before they rejoin the milking herd. Building on that discussion, this follow-up study looks even deeper, not just at the cow, but at what happens to her offspring.

A long-term dataset from the Gatton Research Dairy (GRD, 2016–2025) at the University of Queensland was used to group cows according to whether they experienced consistent heat stress (Temperature-Humidity Index > 68) in the 45 days before calving. We compared pure Holstein cows to Slick-gene Holsteins and looked at how heat exposure during late pregnancy affected both the dam and her offspring. Performance was evaluated through total milk yield over a full 305-day lactation, along with lactation patterns and calf growth.

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For readers of Northern Horizons who may not be familiar with the term "Slick-gene Holstein," here is a brief explanation: A Slick-gene Holstein is a Holstein cow that carries a gene variation that makes its hair coat much shorter and smoother than normal (Figure 1). Because of this short coat, these cows cope with heat better. They stay cooler, sweat more efficiently, and maintain production under hot conditions. The gene came from Senepol cattle and was introduced into Holsteins through crossbreeding. Only one copy of the gene is needed for the cow to show the slick coat.

The results make it clear that heat stress before calving reduced milk production in pure Holstein cows (Figure 2, Page 2). Holsteins that experienced heat in late pregnancy produced 6,882 L in the following lactation, compared with 7,005 L when calving under cooler conditions. In contrast, Slick-gene Holsteins not only maintained production under heat but outperformed all other groups. Slick cows exposed to heat produced 8,110 L, and even under cool conditions they reached 7,738 L. This means Slick cows out-produced Holsteins in both environments by a large margin, showing an advantage of more than 1,200 L when heat stressed and over 700 L even in cooler conditions. These results indicate that the Slick trait offers a consistent performance benefit to the dam regardless of environmental conditions. It is important to note that this was an observational study, and the results should be interpreted with caution.

Figure 1. *Gatton Research Dairy Holstein and Slick-gene Holstein cows*

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Effect of heat stress on lactation performance of the DAM

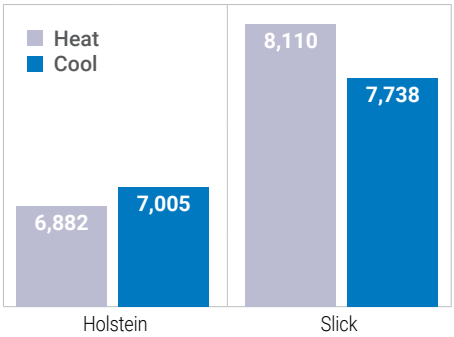

Figure 2. *Effect of late-pregnancy heat stress on milk production in Holstein and Slick dams*

The drop in milk production seen in heat-stressed dams is only part of the story. The effects also showed up in their calves. The first sign was visible at birth, where calves born to Holstein dams under heat stress averaged 37.6 kg, compared with 39.1 kg when their dams calved in cooler conditions (Figure 3). Slick calves were also lighter when heat stressed (36.9 kg vs 37.6 kg under cool conditions), but the overall difference between the breeds is important.

When we look at the average across both environments, Holstein calves weighed 38.3 kg at birth, while Slick calves averaged 37.3 kg. In other words, Slick calves start life about one kilogram lighter. That may sound minor, but it has practical implications. A slightly smaller calf has lower maintenance requirements and needs less feed to grow. In hot conditions, eating less can be an advantage, because every kilo of dry matter eaten generates internal heat the animal has to get rid of.

So, while heat stress lowered birthweight in both breeds, the naturally smaller size of Slick calves may help them cope better with heat from day one. This aligns with what we saw in the dams. Slick cows are not only less affected by heat, but they may also pass on traits that help their calves manage it more efficiently.

Effect of heat stress on birthweight of the offspring

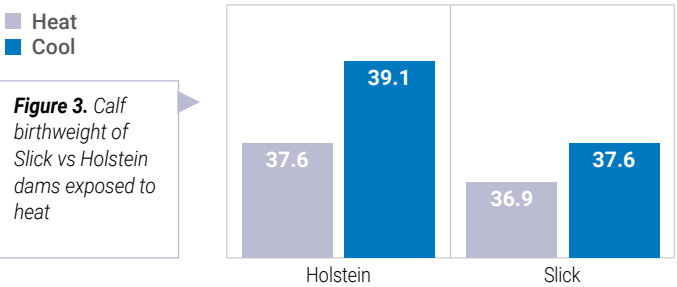

Figure 3. *Calf birthweight of Slick vs Holstein dams exposed to heat*

Two years after birth, the long-term effects of heat stress during late pregnancy showed up again. This time when the offspring entered the milking herd. Holstein daughters of heat-stressed dams produced 7,002 L in their first lactation, compared with 6,586 L when their dams calved in cooler conditions (Figure 4). This confirms that the drop seen at birth carried through into adulthood.

The Slick offspring, however, stood out just like their dams. Daughters of heat-exposed Slick cows produced 7,980 L, and even under cool conditions they reached 7,336 L. That means Slick cows not only started lighter at birth but still went on to outperform Holsteins later in life, regardless of whether they were born under heat or not. When we connect all three steps, dam performance, calf birthweight, and the daughters' first lactation it becomes clear that the Slick gene supports both generations by helping them cope with heat, maintain intake efficiency, and protect milk yield over time.

Effect of heat stress on lactation performance of the offspring

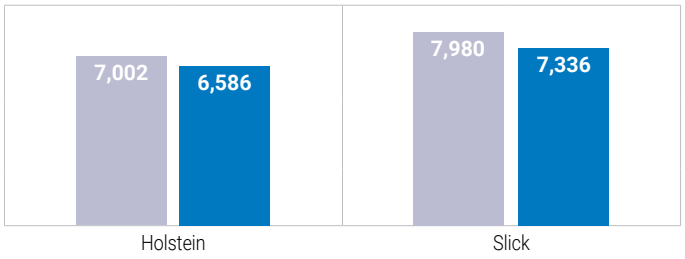

Figure 4. *Lactation performance of daughters born under heat and cool conditions*

This study shows that heat stress in the last weeks of pregnancy doesn't just hurt the cow in the next lactation, it also leaves a lasting mark on the next generation. Holstein dams exposed to heat before calving produced less milk and gave birth to lighter calves. The cost of heat stress is not limited to one season, it carries through to the cows that replace them. Slick-gene Holsteins told a different story. Even when exposed to the same heat conditions, Slick dams maintained higher milk yields and their daughters outperformed Holstein offspring. Their calves were also naturally smaller at birth, which likely reduces feed requirements and internal heat load, an added advantage in hot conditions.

Taken together, the results make one thing clear: managing heat stress in late pregnancy should be a priority, not just to protect the current herd, but to protect the replacements coming after them. And where genetics can help, the Slick trait stands out as a practical tool offering resilience for both the cow and her daughters, across environments and across generations.

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