

Heat Tolerance ABV

Technote 18

HIGHLIGHTS

- The Heat Tolerance Australian Breeding Value (ABV) allows farmers to identify animals with greater ability to tolerate hot, humid conditions with less impact on milk production.
- It is expressed as a percentage, with a base of 100.
- To breed for improved heat tolerance, look for high BPI bulls with a Heat Tolerance ABV of greater than 100. Use a team of bulls to allow for the lower reliability of the Heat Tolerance ABV.
- High selection pressure for heat tolerance alone will improve fertility but compromise production.

Changing weather patterns have created a trend towards higher temperatures in some Australian dairying regions. In hot, humid conditions, cows expend more energy regulating their body temperature. This can affect their feed intake, milk production, milk composition and fertility.

Dairy farmers use a variety of tools to manage hot, weather, such as providing shade, fans, water sprinklers, extra drinking water and changing the timing of milking and feeding. Dairy Australia's Cool Cows website provides tools and resources to help farmers with this, including sending alerts according to the weather forecast.

The latest tool is the Heat Tolerance ABV which allows dairy farmers to breed animals with improved tolerance to hot, humid conditions.

Cows and heat

Cows generate heat internally (metabolic heat) as a result of eating and digesting feed. Like most mammals, the dairy cow needs to maintain its core body temperature within a narrow range around 39°C. Cows also take on heat from the environment around them. The cycle of gaining and losing heat absorbed from the environment is on-going and always operates in the context of the metabolic heat a cow is carrying at any given time.

The level of environmental heat a cow gains or loses over time is influenced by:

- air temperature and relative humidity;
- amount of solar radiation;
- degree of night cooling;
- ventilation and air flow; and
- length of the hot conditions.

Hot conditions can result in reduced milk production, protein and fat tests, in-calf rates, liveweight and higher somatic cell counts, more clinical mastitis cases and other cow health problems. Some of these effects last beyond the hot months. Higher production cows are more likely to be affected.

Benefits to cooling cows in the heat include:

- higher summer milk production;
- improved animal health and welfare
- increased 6-week/100-day in-calf rates;
- reduced loss of embryos; and
- increased calf birth weights.

(Source: Dairy Australia Cool Cows).

Some cows respond differently

Within a herd, some cows demonstrate an increased tolerance for hot and humid conditions than others. Genomic technologies give us the opportunity to look for genetic markers for heat tolerance in these cows.

The Heat Tolerance ABV

The Heat Tolerance Australian Breeding Value (ABV) allows farmers to identify animals with greater ability to tolerate hot, humid conditions with less impact on milk production.

It is expressed as a percentage, with a base of 100. An animal with a Heat Tolerance ABV of 105 is 5% more tolerant to hot, humid conditions than average. Its drop in production will be 5% less than average. An animal with a Heat Tolerance ABV of 95 is 5% less tolerant to hot, humid conditions than average. Its drop in production will be 5% more than average.

Reliability

The reliability of the Heat Tolerance ABV is 38% which is lower than conventional production traits but in line with the newer generation of genomic-only traits. Like all new ABVs, reliability is expected to improve with time, as more data becomes available. If placing a high priority on selecting for heat tolerance, allow for its lower reliability, by using a team of bulls.

Heritability

The heritability of heat tolerance is moderate at 12%. This is similar to workability traits and higher than health and fertility traits. Despite the low heritability, genetic selection has achieved significant progress in these traits in the Australian dairy herd.

This low heritability means that environmental conditions and management practices have a big impact on the cow's response to hot, humid conditions and genetics plays a smaller role. However, there is significant variation within Holstein and Jersey breeds which creates the opportunity to identify and breed from animals with better heat tolerance.

Breeding for heat tolerance

To breed for improved heat tolerance, look for animals with both high BPI and a Heat Tolerance ABV of greater than 100; use a team of bulls to allow for the lower reliability.

Heat tolerance is favourably correlated with fertility and unfavourably with production. This means high selection pressure for heat tolerance may improve fertility but compromise production. It is important to check breeding values across the range of traits that are important to you.

Bull rankings

Heat Tolerance is not included in the Balanced Performance Index or other Australian indices so there will be no impact on bull rankings. Heat Tolerance will be considered for inclusion in indices in the next National Breeding Objective review.

Summary

The Heat Tolerance ABV allows farmers to breed cows that are more tolerant of hot and humid conditions with less impact on milk production. With every joining, farmers have the opportunity to make genetic gain. Farmers are now able to breed a herd that responds better to Australia's hotter

environments. This is an additional tool to complement management practices to keep cows cool during hot, humid weather.

World first

The Heat Tolerance ABV(g) is a world-leading trait. Like the Feed Saved ABV, it is one of a new generation of breeding values for traits that are difficult to measure, made possible due to advances in genomic technologies.

Acknowledgement

The Heat Tolerance ABV was developed by DairyBio, a joint initiative between the Victorian Government and Dairy Australia, with funding from the Australian Department of Agriculture and Water Resources.

More information

Heat Tolerance ABVs for bulls at www.datagene.com.au.

More information on heat tolerance in the Australian dairy industry is available at www.coolcows.com.au

Scientific papers

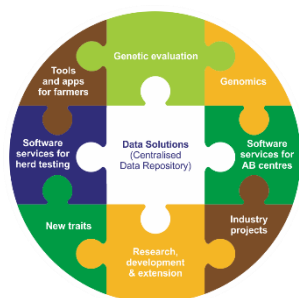
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Nguyen et al 2017. A practical future-scenarios selection tool to breed for heat tolerance in Australia. *Animal Production Science*, 57:1488-1493

Nguyen et al 2017. Short communication: Implementation of a breeding value for heat tolerance in Australian dairy cattle. *J. Dairy Sci.* 100:7362-7367

Nguyen et al 2017. Breeding value for heat tolerance in Australian dairy cattle; a technical platform for implementation. *Herd 17 conference proceedings pp 35-39.*

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About DataGene

DataGene is an independent and industry-owned organisation responsible for driving genetic gain and herd improvement in the Australian dairy industry. Formed in July 2016, DataGene brought together many pre-competitive herd improvement functions such as genetic evaluation, herd testing and herd improvement software development, data systems and herd test standards. DataGene is a Dairy Australia and industry collaboration.

www.datagene.com.au Ph 1800 841 848 E: abv@datagene.com.au