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Heat Stress:

The Modern Dairy Cow is less Heat Tolerant Than in the Past

Every summer, heat stress leads to lost milk production and supressed fertility rates in the modern dairy cow. Selection for more heat tolerant animals, incorporating the slick gene, providing housing conditions with better temperature control, and using nutritional strategies to reduce internal heat production, all have potential to help deal with a problem that is costing farmers millions of dollars worldwide.

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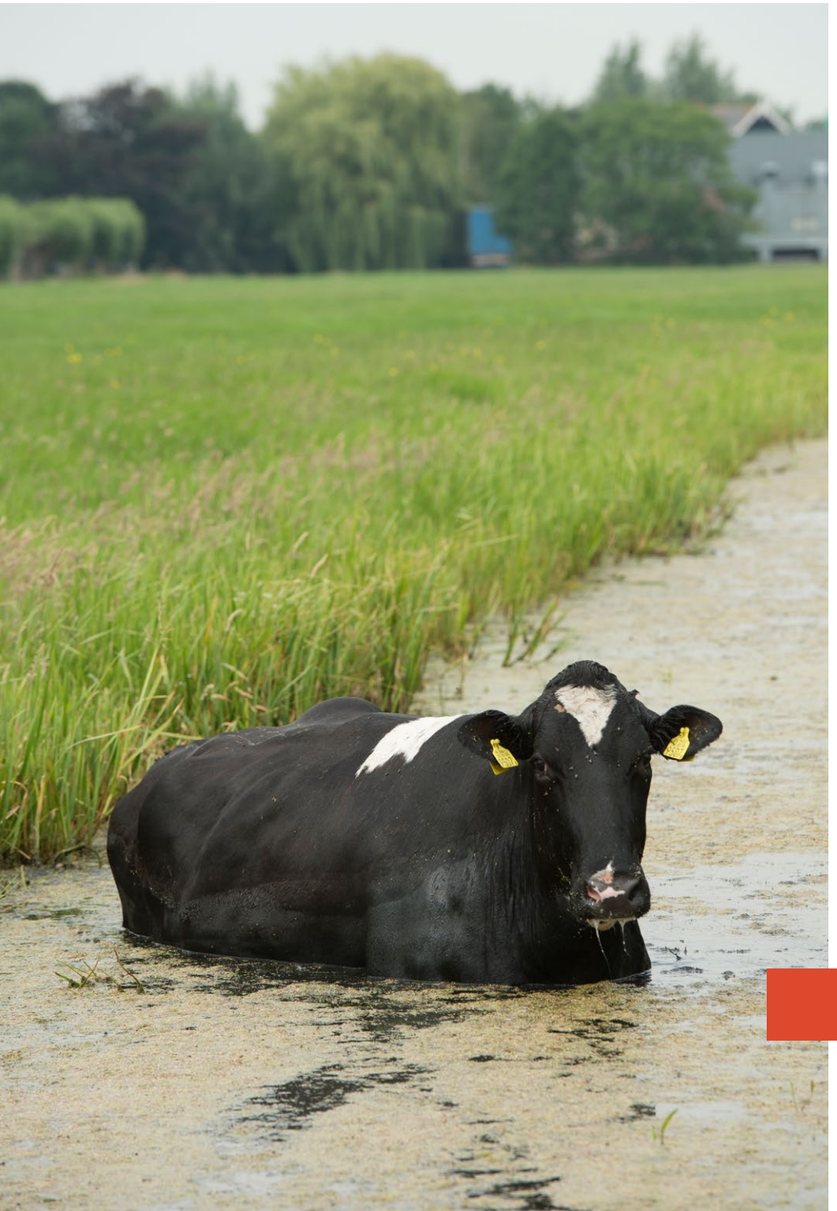

Heat stress in dairy cows is a very costly issue for farmers around the world.

High producing cows have to metabolize greater volumes of feed and so generate more heat. Selection for a higher producing cow therefore comes at the expense of heat tolerance. However, by having genetic evaluations for this trait we can select to avoid animals that are the most adversely affected by heat stress. So far Australia and Italy are the only countries to implement genetic evaluations for heat tolerance, though other countries are likely to follow. Italian figures show that heat stress occurs at temperatures above 25°C/75°F, especially when combined with higher humidity. In Italy, daughters of a bull rated 105 for heat tolerance will produce almost 1.5kg more milk than daughters of a bull rated 95 for heat tolerance when under heat stress conditions; that's a difference of $1 per day. With approximately 180 days of +25°C/75°F temperatures per year in Italy the difference becomes significant.

DEFENCE

Feed intake drops by 8-12% with heat stress, causing a drop in the volatile fatty acid production, and in turn milk production. A cow's main defence when core body temperature climbs above 38.8°C is to stand for longer periods of time. This results in decreased blood flow to the udder and so a drop in milk production. The best way to get a heat stressed cow to lie down in a comfortable stall and make milk is to cool her core body temperature. Fans providing wind speeds of at least 7km per hour, and evaporative cooling systems to imitate sweating, help to cool the cow.

AIR MOVEMENT

Air that moves freely past a cow remains one of the best ways to cool the animal. Modern barn design where the side walls can be completely opened allows much better use of natural ventilation. However, often on a calm summers day there is insufficient air movement and so fans have become standard equipment in most dairy barns. 'Rather than using fans to blow stale air out of a barn we prefer to set fans up to blow fresh outside air into a barn,' explains Eric Bussem from Abbi-Aerotech BV in the Netherlands. Abbi-Aerotech started 40 years ago and is now the leading supplier of fans for agricultural barns in Europe. A major focus for the company is getting maximum energy efficiency with its fans. 'Our latest models are the most efficient on the market. Being direct drive improves efficiency, and it also means there are no maintenance costs,' explains Eric. 'The maximum draw for our latest fans is 530 W/h when operating at maximum speed, but in fact they will spend much of the time operating at much slower speeds requiring just 15 W/h, way less than it takes to operate a light bulb.'

SIDE WALLS

A lot of efficiency gains are achieved by the location of the fans. 'In setting up ventilation systems for dairy barns we try to augment natural airflow to achieve maximum efficiency,' continues Eric. 'Rather than having fans creating an air current running the length of a barn we now set up fans to blow air across the barn from the sides. This means that the air travels a shorter distance so you are supplying more fresh air to the animals. Because the stalls face towards the side of the barn rather than the ends, it also means that air flows past both sides of the cow doing a much better job of cooling her when compared to air flowing the full length of a barn. With air current going the length of the barn, cows compete for the stalls near the end where there is better air, but with cross ventilation the cooling effect is the same for all stalls and the cows are more content and comfortable so they spread out more evenly around a barn.'

DRY COWS

However, an often-overlooked aspect to heat stress is the heat load on dry cows. Dr. Geoffrey Dahl has specialized in the area of milk production and heat stress at the University of Florida since 2006. He noted that cows that were heat stressed during the 6-week dry period have a reduction in milk yield of 2 litres per day for the next lactation when compared to cows that were cooled during the dry period. He also noted that cows had to be cooled for the full dry period to get the full effect. Heat stressed cows have a decreased number of alveoli in the udder when compared to cows that had been cooled during the dry period. However, Dr. Dahl reported that losses go further than just production. Cows that were heat stressed during the dry period had more retained placenta, more mastitis and respiratory disease, and were more difficult to get back in calf. Calves from heat stressed mothers were born 3 days early, with reduced birth weights that were still evident at weaning and puberty, and had reduced immune status and reduced survival rates. They produced 2.2ltr less milk per day, increasing to 4ltr less per day by 3rd lactation. And their daughters in turn – granddaughters of the cows that were heat stressed in the dry period – also had lower production. Dr. Dahl was one of the speakers taking part in the Phibro Heat Stress Congress 2023. Phibro markets the product OmniGen, a feed additive designed to alleviate stress effects which when fed to dry cows at the University of Florida overcame the heat stress issues.

HYDRATION

Easy access to clean water is of course necessary at all times. However, maintaining hydration goes much further than water availability. Rehydration should be a core part of the heat stress mitigation strategy on farms. While environmental management cools the cows from the outside, rehydration cools them from the inside out. It helps to maintain feed and water intake, provides lost nutrients and supports gut health. Bovine BlueLite from TechMix is a product that maintains hydration through times of heat stress. It comes in the convenient forms of soluble powder or pellets to fit all kinds of farms. The core of the BlueLite technology is built on a palatable and buffered source of electrolytes combined with energy sources. BlueLite formulation contains components that help to maintain cell volume and fluid balance and is also fortified with vitamins and antioxidants necessary for combatting toxins and oxidative stress. Research demonstrates decreased body temperature and reduced negative effects on production and reproduction when supplementing Bovine BlueLite during times of heat stress.

SLICK

Incorporating the "slick" gene that gives a short hair coat and more sweat glands in the skin enables animals to better deal with the heat. The origin of the slick gene traces back to Bos Indicus or Zebu cattle and has been added to Holstein breeding via the Senepol tropical breed. The Senepol was developed by Hans Lawaetz of St. Croix in the Caribbean in the 1950s by crossing the N'Dama breed, originally from Senegal, with English Red Poll (thus the name Senepol) to improve their temperament and production. In the 70s and 80s, Senepol cattle were exported to many countries including Puerto Rico, Venezuela, Brazil and Australia. Raphy Lopez, a long-time Holstein breeder from Puerto Rico, used bloodlines from top US Holstein cow families and combined them with the Senepol to produce cattle better suited to the tropics. The University of Florida imported slick genetics for their work on producing more heat tolerant cattle, and made available semen from such bulls as Slick Gator and Slick Blanco. A significant step forward came when Raphy Lopez bred the homozygous slick bull El-Remanso Sinba-Red. With all his calves carrying the slick gene it was much more attractive than the 50% of slick calves resulting from the earlier heterozygous bulls. More recently, keen slick enthusiast Mark Yeazel from Ohio has produced a homozygous slick red and polled bull named Ja-Bob Eclipse who is now 4 months old and is sure to attract greater interest to slick breeding. In Europe, Rudolf Haudenschild and his KeepCool Syndicate from Switzerland is a keen promotor of slick genetics and markets embryos and semen from slick bloodlines. ●

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