HEAT STRESS IN DAIRY COWS
Assessment and mitigation

During summer heat stress is one of the factors that have the most significant negative impact on milk production, behaviour, health, and welfare of dairy cows, especially in high productive animals. Heat stress accentuates a negative energy balance, and reduces milk production and reproductive efficiency, leading also to economic losses. Heat stress results from adverse environmental conditions, such as high temperature and relative humidity, which causes an imbalance between environmental factors and the body temperature of cows in the resting state. There is also a correlation between increased milk production and heat production, which means that dairy cows of high genetic merit are always more sensitive to the negative aspects resulting from heat stress. Considering the fact that we can expect an increased frequency of extreme weather events in European countries, it is very important to understand the causes of heat stress in dairy cows to improve milk production, reproductive performance, and welfare.

Assessment of heat stress in dairy cows

In recent years the Welfare Quality protocol has proved a useful tool for evaluating the welfare of dairy cows. There is however an essential gap regarding heat stress in the protocol, since an indicator for this aspect has not yet been included. It is known that heat stress is influenced by a combination of different environmental factors (temperature, relative humidity, solar radiation, air movement, and precipitation). Several approaches have been proposed to measure the level of heat stress of animals. Most work has been done on the so-called THI (temperature-humidity index), which combines temperature and relative humidity. THI makes it possible to estimate the sensation of thermal (dis)comfort, and is widely used to assess the impact of heat stress on dairy cows. This index is affected by air velocity, radiation, and factors such as posture and density of animals, their production of heat, and the type of insulation of the housing. In temperate climates, the heat stress reduces daily milk production by 20% when THI values increase from 68 in spring to 78 in summer. Also, for each additional point in the THI values above 69, there is a decrease of 0.4 kg of milk per cow per day. Figure 1 shows the variation of the THI with temperature and relative humidity.

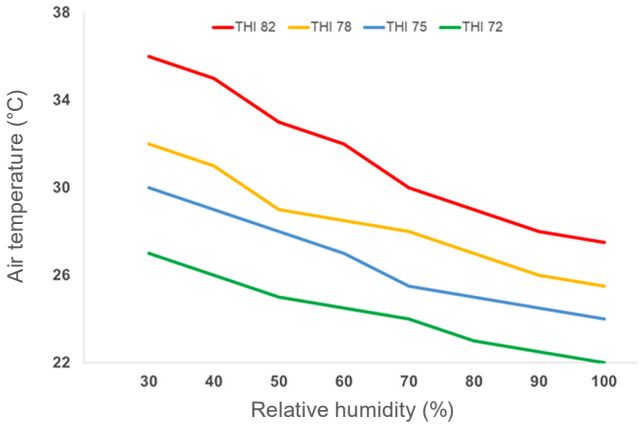

Figure 1: Variation of THI with relative humidity and temperature.

Although the THI could be a valuable addition in the Welfare Quality protocol, this protocol is mainly designed to be completed by welfare professionals. To assist farmers in their day-to-day assessment and management of heat stress, there exists a practical scoring approach for heat stress assessment using a scale based on behaviour and breath frequency (Table 1).

Table 1 - Panting score using behaviour and breath frequency to quantify heat stress

Adapted from Mader et al., 2006

Panting score	0	1	2	3	4
Description	Normal with no panting.	Slight panting, mouth closed with no salivation.	Fast panting with salivation present. No open mouth panting.	Open mouth panting and some drooling. Neck extended and head usually up.	Open mouth with tongue fully extended for prolonged periods and excessive drooling. Excessive salivation; usually with neck extended forward.
Breaths per minute	< 60	60 - 90	90 - 120	120 - 150	> 150

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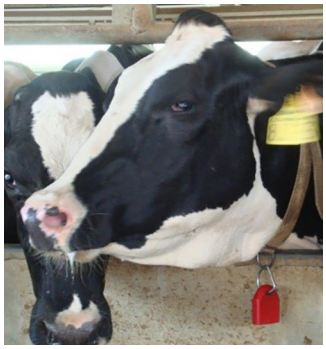
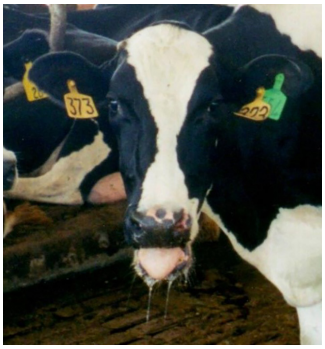
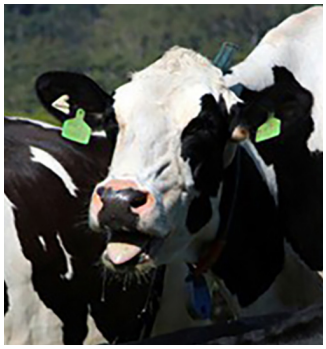


Panting score 2



Panting score 3



Panting score 4

Heat stress mitigation of dairy cows

Finally, in response to obvious signs of heat stress, it is important to take action, in order to mitigate the heat stress problem of dairy cows. A number of approaches are possible, including free access to water; adequate sizing of water trough and water quality; the provision of natural and / or artificial shadows; an increased feeding frequency and other dietary solutions to improve heat stress; and the use of fans and spraying of water in the stable. Of course, several of these approaches can be and are in fact most often used simultaneously. For more information on this topic, please visit the EuroDairy webinar: www.eurodairy.eu/resources/webinar-managing-heat-stress-in-dairy-cattle/

FARMER CASE

Quote from Manuel Martins Silva, dairy farmer in Portugal

From June to September, I always need extra handling to decrease the temperature of my farm environment, because I know that heat stress is a severe problem that affects cow's milk production, especially in those months of the year.

Reference

Mader, T. L., Davis, M. S., & Brown-Brandl, T. (2006). Environmental factors influencing heat stress in feedlot cattle. Journal of Animal Science, 84, 712-719.

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