

Bioactive additives can help alleviate heat stress

In the coming years, heat waves may occur more frequently and last longer. Beyond reducing the quality and quantity of forage, high temperatures and humidity also affect productivity and the reproductive performance of livestock. The management of heat stress is already a major challenge in animal production, and given the growing demand for food in the world, it will become an even larger strategic challenge in the future.

How to define heat stress

Like poultry or other mammals, ruminants are homeothermic animals. They are designed to maintain an ideal and stable internal temperature by regulating their various metabolic processes. Generally, their internal body temperature is higher than their surrounding environment and thermoregulation results from endothermic mechanisms that produce heat. Nevertheless, when an organism absorbs or produces more heat than it can dissipate, thermoregulation fails and the animal is unable to maintain its thermal balance. Heat stress occurs.

The Temperature Humidity Index (THI) is a combined value of air temperature (AT (°F)) and humidity (RH). It is usually used to measure heat stress levels. Several formulas exist to calculate THI. As an example: $THI = AT - (0.55 - (0.55 * RH) * (AT - 58))$ (Vitali et al., 2009). Modern breeders are used to monitoring their THI levels and implementing different actions according to these levels.

A matter of homeostasis consequences of metabolic adaptation

In conditions which may induce heat stress, animals would change their behaviours to regulate their temperature.

- Usually, increasing water intake and panting help to cool animals by increasing water evaporation. However, the respiratory rate increase also causes blood alkalosis. In order to reduce their blood pH level, animals excrete bicarbonate in their urine. This loss of bicarbonate will eventually lead to rumen acidosis. (See Figure 1)

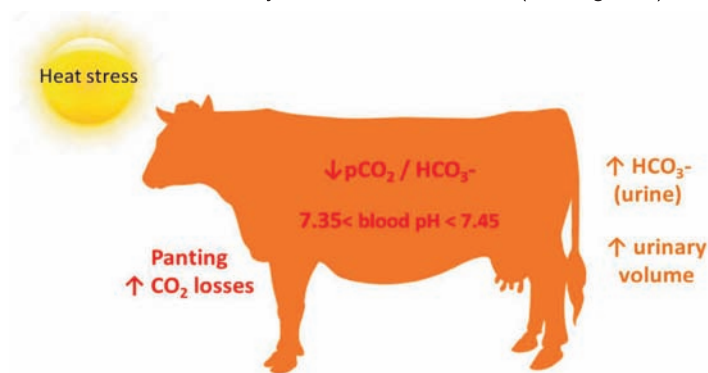


Figure 1: Heat stress effect on rumen pH (Schneider et al., 1988)

- Animals reduce feed intake in order to decrease heat production generated by digestion. This may cause a negative energy balance.
- Animals increase blood flow to the skin to dissipate heat. This leads to less blood flow to the gut, thus decreasing digestion efficiency.
- Standing increases the effective surface area of the skin able to dissipate heat, but can engender problems such as lameness.

From a performance point of view, all these natural metabolic adaptations cause a reduction in the production of meat or milk, increased sensitivity to metabolic diseases (acidosis, ketosis) and affect reproductive performance. High-yield dairy cows start to decrease production from THI 68.0, a value that can be attained at

just 22°C if the relative humidity reached 45% (Zimbelmann et al., 2009). From a mean daily THI of 73.2, sustenance intake can decrease by 2.3kg/d and, consequently, milk production can decrease by 2kg (Khelil-Arfa et al., 2014).

How standardized and encapsulated bioactives enhance resistance to heat stress

Optimized rumen functions

XTRACT® Ruminant, a standardized blend of capsicum oleoresin, cinnamaldehyde and eugenol, optimizes volatile fatty acids profile, thus improving energy metabolism. By improving rumen efficiency, it limits the impact of decreased dry matter intake.

Better feeding behaviour

XTRACT® Ruminant helps restructure feeding behaviour: the number of meals during the day increases, while the size of each meal decreases. The total dry matter intake is not affected. Thus, pH drop is slowed down, limiting the risk of acidosis during periods of heat stress.

Restructuring the feeding pattern also contributes to stabilizing heat during digestion, which will be more equally divided throughout the day. XTRACT® Ruminant also improves water intake, helping to reduce body temperature. See figure 2.

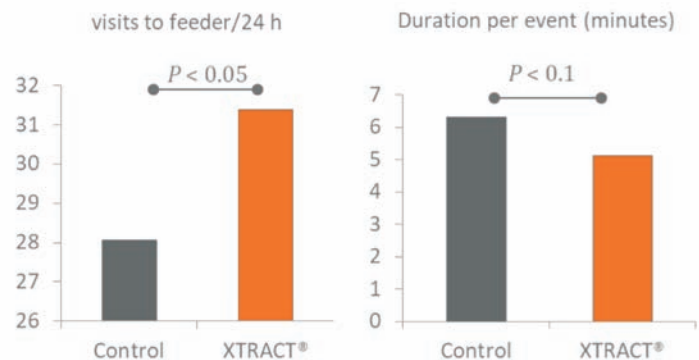


Figure 2: Number of visits and duration per meal (Cardillo, 2011) Conclusion

Today, the negative effect of heat stress on ruminants is well known and well documented. Animals adapt their behaviour, but this induces physiological changes and causes metabolic disorders. Bioactives represent a promising natural strategy to alleviate heat stress and support animal metabolism during these challenging times.



Want to learn more? Contact our expert

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