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Negative impact of heat stress in livestock.

As we have discussed in our previous article, **heat stress has a detrimental effect on the productivity of the animals reducing the profitability of the farming industry**. Heat stress does not only affects meat and milk production negatively but also **increases mortality and decreases reproduction** (Nardone et al., 2010). However this reduction in animal performances can be minimised with feeding strategies.

There are several nutritional strategies to consider during heat stress:

1. Providing adequate water

As much as water is vital for mankind, it is equally important for animals. Water is an important nutrient that has many functions in the body, such as:

- *To digest the food.*
- Cool animals down.
- Removal of waste from the body.
- Nutrient transport.

During high temperatures the amount of water intake increases. It is important to **ensure that there is always water available**, especially with high producing cows (Berman, 2011). Water is of outmost

importance for dairy cows, because milk constitute of 85% (water).

2. Decreased fibre intake

Reducing forage and increasing the concentration content has been used to increase energy due to the fact that energy is a limiting nutrition in the diet. **High fibre increases heat load and lead to heat stress. Therefore it is recommended that a low amount of hay and alfalfa is given to dairy cows during extreme heat conditions.**

In addition, to achieve a higher dairy milk yield, lower respiratory rates and lower body temperature, feeding a non-degradable fibre of 30% DM is highly recommended (West et al., 2003). Ensure that when reducing the amount of dietary fibre, it is not completely low because it also plays an important role in the rumen by giving off energy to the dairy cows. However, if it gets to the point where the NDF is way low, the rate of 0.25% DMI for each of the 5% reductions in DMI to a maximum of 1% DMI, sodium bicarbonate can be added to the diet to maintain the rumen pH and minimize depression in milk fat production (Robinson, n.d).

3. Protein formulation in ration

When dairy cows undergo heat stress, it results to a negative nitrogen balance, thus, it is important to increase the amount of protein. Dietary essential amino acids such as lysine and methionine are recommended during heat stress conditions.

In order, to achieve a high metabolizable protein for milk production, it is advisable to use 2.4% of Methionine and 7.2% of Lysine (NRC, 2001). This is because **methionine plays an important role in dairy cows by**

improving milk production and antioxidant capacity (Nichols et al., 1998). Hence, we can prevent heat increasing freshness and improving life conditions during hot weather. Whereas, **Lysine is vital for milk protein synthesis.**

4. Supplementation of vitamins and minerals

Vitamin A, C and E are highly recommended during hot days.

Selenium should be supplemented to dairy cows during hot climates because it protects against oxidative stress (Surai, 2006).

Niacin also known as **vitamin B3 should also be given to dairy cows because it helps to alleviate heat stress by increasing evaporative heat loss** from the body and also by reducing the effects of heat at the cell level (Lundqvistet al., 2008).

5. Addition of fat to the ration

During extreme heat conditions it is important to carefully use fat in diets with an amount of 5% or lower fat in the ration does not have negative effects on the rumen microflora, hence lower than this amount it can be added safely.

Products like greases, oils and vegetable fats are not good because they interfere with microbial growth in the rumen (Robinsin, n.d). Hence, the use of treated fat is advisable because it by-passes the rumen environmental intact reducing the effects of microbial disturbances in the rumen (Giuseppe et al., 2018)

6. Addition of feed additives

The use of fungal culture and plant extracts are highly recommended in rations because they help in regulating body temperatures. The supplementation of yeast such as Aspergillus oryzae to dairy cows lowers the rectal temperature of heat stressed cows. In addition, **yeast also improves the nutrient flow to the small intestines and dairy cow performances during extreme heat conditions** (Higginbotham et al., 1993). The use of *insulin* has also been used to improve the possibility of surviving heat load in dairy cows (Rhoads et al., 2013).

References

Higginbotham GE, Bath D, Butler LJ. 1993. Effect of feeding an Aspergillus oryzae extract on milk production and related responses in a commercial dairy herd. J Dairy Sci. 76:1484–1489.

Nardone A, Ronchi B, Lacetera N, Ranieri MS, Bernabucci U. 2010. Effects of climate changes on animal production and sustainability of livestock systems. Livest Sci. 130:57–69

National Research Council (NRC). 2001. Nutrient requirements of dairy cattle (7th ed.) Washington, DC: National Academy of Science.

Nichols JR, Schingoephe DJ, Maiga HA, Brouk MJ, Piepenbrink MS. 1998. Evaluation of corn distillers grains and ruminally protected lysine and methionine for lactating dairy cows. J Dairy Sci. 81:482–491.

Surai PF. 2006. Selenium in food and feed, selenomethionine and beyond. In: Surai PF, editor. Selenium in nutrition and health. Nottingham (UK):

Nottingham University Press; p. 151–212.

Berman A. 2011. Invited review: are adaptations present tosupport dairy cattle productivity in warm climates? J Dairy Sci. 94:2147–2158.

Huber JT, Higginbotham G, Gomez-Alarcon RA, Taylor RB,Chen KH, Chan SC, Wu Z. 1994. Heat stress interaction with protein, supplemental fat, and fungal cultures. Dairy Sci. 77:2080–2090

West JW, Mullinix BG, Bernard JK. 2003. Effects of hot, humidweather on milk temperature, dry matter intake, and milkyield of lactating dairy cows. J Dairy Sci. 86:232–242.

Lundqvist M, Stigler J, Elia G, Lynch I, Cedervall T, DawsonKA. 2008. Nanoparticle size and surface properties deter-mine the protein corona with possible implications forbiological impacts. Proc Natl Acad USA. 105:14265–14270

Giuseppe Conte, Roberta Ciampolini, Martino Cassandro, Emiliano Lasagna,Luigi Calamari, Umberto Bernabucci & Fabio Abeni, 2018. Feeding and nutrition management of heat-stressed dairy ruminants. Italian Journal of Animal Science.

Rhoads RP, Baumgard LH, Suagee JK, Sanders SR. 2013. Nutritional interventions to alleviate the negative consequences of heat stress. Adv Nutr. 4:267–276.

Robinson P. H., Feeding Strategies for Heat Stressed Dairy Cows During Hot Dry Weather. Accessed dated http://cdrf.org/wp-content/uploads/2013/09/Feeding-strategies-to-mitigate-heat-stress.pdf