

Chronic heat stress lowers serum cortisol levels in Holstein cows

Roman Mylostyyvi¹, Marcjanna Wrzecińska^{2,3}

¹Dnipro State Agrarian and Economic University, Dnipro, Ukraine

²West Pomeranian University of Technology, Szczecin, Poland

³VERUS Association of Agri-Food Sector Producers, Poland

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Heat stress severely affects dairy cows, especially in warmer months, raising concerns for their welfare and productivity. It leads to physiological changes, notably in cortisol levels, a key stress indicator. Prolonged heat exposure can suppress cortisol, impacting metabolism, immune function, and milk production.

In this study, eighteen lactating Holstein cows (2nd or 3rd lactation) were divided into two groups: 8 cows were placed in the hyperthermia group (HYP) during the summer (August), while 10 cows were assigned to the control group (CON) in the autumn (October). The cows were randomly allocated to each group, and there were no significant differences in days in milk or milk yield between the groups. However, seasonal variations led to significant differences in milk fat and protein content. The research was conducted on a commercial dairy farm in Ukraine, where cows were kept in loose housing with naturally ventilated barns and fed a total mixed ration (TMR) based on corn silage. Weather conditions were monitored using data from a nearby meteorological station, and heat stress (HS) was assessed using the temperature-humidity index (THI), with a threshold of 72 used to indicate the onset of HS. The HYP group was subjected to heat stress, with THI values exceeding 72 for 45 consecutive days, while the CON group remained in thermal comfort, with a THI of 63 during blood sampling. Blood samples were collected from the HYP group during a heatwave in August, while samples from the CON group were taken in October after cooler weather, as previously described [3].

The mean cortisol level in cows subjected to hyperthermia was 27.25 ± 2.92 nmol/L, while in the control group, it was 39.45 ± 3.26 nmol/L. This indicates a 30.9% reduction in cortisol levels in the hyperthermia

group compared to the control group. This significant difference in cortisol levels suggests that prolonged exposure to heat stress can lead to a decrease in the secretion of cortisol, a key stress hormone. Cortisol plays an important role in the regulation of metabolism, immune response, and overall stress adaptation in cows. The reduced levels in the hyperthermia group may indicate an adaptive response to chronic heat stress, where the body's ability to manage stress becomes impaired over time. Prolonged heat stress might suppress the hypothalamic-pituitary-adrenal (HPA) axis, leading to lower cortisol production [2]. This is consistent with studies showing that long-term stressors, such as heat, can lead to an exhaustion of the stress response system in dairy cows, which in turn could impact their overall health and productivity.

In conclusion, chronic heat stress reduces cortisol levels in dairy cows, potentially compromising their ability to manage stress and impacting their productivity. Addressing heat stress is vital for enhancing animal welfare in the face of rising global temperatures.

Literature available from the author/s.