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## Thermal stress and its significance in buffaloes

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**T**hermal stress is a major concern for all livestock production systems owing to its negative impact on health and production. India loses 3.2 million tonnes of milk production at present due to thermal stress and global warming was further hypothesized to reduce milk production by 15 million tonnes by 2050. Intergovernmental panel on climate change (IPCC) anticipates a rise in Earth's surface temperature by 0.2 °C per decade and thus, it might lead to an overall spike of around 1.8 °C to 4.0 °C by 2100 (IPCC, 2007). The major factors that contribute to thermal stress are the relative humidity (RH) and ambient temperature (aT). The inability of the animal to lose heat to the surroundings is defined to be thermal stress; it results in accumulation of heat load due to inability to lose heat to the surroundings. Thermo-neutral zone (TNZ) is the range of ambient temperature where homeotherms survive without any expenditure of energy to maintain body homeostasis. Any deviation in the ambient temperature which goes beyond the upper critical temperature could terminate in heat stress (Sahu et al., 2019). Most of the livestock species experience stress of varying degrees but are able to cope with these environmental stressors through behavioral measures such as sweating, panting, drinking water, shivering or by regulating their metabolic rates.

As the ambient temperature around the animal rises, above the body temperature the animal gains heat via conduction/convection/radiation. High RH accompanied by high aT further compromise animal's ability to lose heat to the surroundings. However, animals being homeotherms operate numerous behavioral (shade seeking, orientation of body posture away from sunlight, wallowing, reduced motor activity) and physiological alterations including increased respiratory rate to promote

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evaporative heat loss and increased heart rate to deviate blood flow from the centre to the periphery to allow heat loss via skin.

Buffaloes are the most affected species due to their anatomical features. Buffalo population in India comprises of 109 million which contributes to 50% of India's milk production. Buffalo population contributes to livelihood of small, medium and large scale farmers all over the country. Despite of their high milk production, buffalo population in India is being constantly challenged by thermal stress due to hot and humid equatorial tropical climate and are insufficiently thermo tolerant compared to cattle because of differences in heat regulating mechanisms such as black skin and lower density of sweat glands. Thermal stress results in reduced feed intake which is a thermoregulatory mechanism to reduce further heat accumulation, altered hemato-biochemical profile and deviation of energy for thermoregulation i.e. less blood and nutrient flow to udder which deviate energy for heat loss mechanisms. These disturbances finally impair production and reproduction parameters in buffaloes.

Hence it is very important to manage buffaloes during summer to maintain optimum productivity, health and well being of the animals.

## References

Intergovernmental panel on climate change. 4th assesment report. IPCC. Geneva, Switzerland.  
S. Sahu, S.R. Mishra, S.S. Behera, C. Mishra, S. Mohapatra, N. Dalaí, a.P.K. Mahapatra & a.K. Kundu (2019) Impact of heat challenge on expression dynamics of HSP90 in cardiac cells of goat, Biological Rhythm Research, DOI: 10.1080/09291016.2019.1672018.