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When Cows Stand Instead of Lying Down: Behaviour as an Early Indicator of Heat Stress and Poor Comfort

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Abstract

Climate change affects livestock production and performance. To maintain their productive potential, animals must adapt to changing climatic conditions. In response to a particular stress, animals may exhibit behavioural or physiological changes, or both. The nature and extent of these responses can vary depending on the animal's previous experience with the stressor, its duration and intensity, the animal's physiological status, and the surrounding environmental conditions.

Keywords: Climate, Behaviour, lying, standing, heat stress

1. Introduction: Cow behaviour is closely linked to their health and welfare. Changes in normal activities such as lying, standing, eating and rumination may provide early signs of health problems or discomfort. Regular observation of these behaviours can therefore help farmers identify health issues early, monitor animal welfare, and make appropriate management decisions, reducing production losses.

The temperature-humidity index (THI) is a combined assessment of ambient temperature and air moisture on the animal, or a measure of an animal's discomfort. When the temperature rises above **25°C**, especially when relative humidity is above **50%**, animals may experience

discomfort and a decline in productivity. In dairy cattle, a THI of **72–78** generally indicates mild heat stress, while a THI above **80** indicates more severe heat stress (Sastry & Thomas, 2021).

2. Lying and Standing Behaviour in Cattle

2.1 Standing Behaviour

Standing is a normal activity associated with feeding, movement, rumination and other activities. However, the duration and frequency of standing may change in response to environmental conditions. Standing behaviour is important when assessing the comfort and welfare of cattle. In hot conditions, increased standing may also facilitate heat dissipation by exposing more body surface area to air movement and convection. Allen et al. (2015) discussed this mechanism in heat-stressed dairy cows.

2.2 Lying Behaviour

Lying is an important resting behaviour in cattle. Cows spend a considerable proportion of the day lying down for rest. Adequate lying time supports normal resting behaviour, and changes in lying duration can provide useful information about animal comfort.

3. Behaviour in Response to Heat Stress

3.1 Lying and Standing Behaviour in Response to Heat Stress

Heat stress alters the normal lying and standing behaviour of dairy cows. As heat load increases, cows generally spend more time standing and less time lying. Allen et al. (2015) reported that standing behaviour increased from 43.6% at THI <68 to 68.2% at THI 80–89, indicating a clear change in standing behaviour as heat load increases.

3.2 Increased Standing during Heat Stress

Standing is one of the important behavioural responses to increasing heat load. When cows stand, more body surface is exposed to air movement, which may facilitate convective heat loss. Standing may therefore help cows cope with heat stress by promoting heat dissipation (Allen et al., 2015).

3.3 Reduced Lying during Heat Stress

Reduced lying may partly reflect the cow's attempt to improve heat dissipation. When lying, more of the body is close to the ground, whereas standing exposes more body surface to surrounding air movement. Thus, under hot conditions, cows may reduce lying time and remain standing for longer periods as part of their behavioural response to heat load (Allen et al.,2015).

3.4 Role of Core Body Temperature

The changes in lying and standing behaviour are not determined by environmental temperature alone; they are also associated with the cow’s internal body temperature. Allen et al.

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(2015) reported that cows were less likely to lie down as core body temperature increased, while higher core body temperature was associated with longer standing and shorter lying bouts.

3.5 Evidence from Seasonal Observations

Seasonal observations further support the relationship between heat load and lying and standing behaviour. Provolo and Riva (2008) reported lower lying and greater standing behaviour during the warmer period compared to greater lying behaviour during the cooler period.

However, their observations also showed that THI alone did not explain behavioural changes. The authors emphasised the importance of season, time of day, housing conditions and other environmental factors when interpreting lying and standing behaviour.

3.6 Welfare Significance and Behavioural Indicators

Lying is an important resting behaviour, and a prolonged reduction in lying time may indicate that cows are experiencing environmental discomfort. At the same time, increased standing can be an adaptive response to heat load, but excessive or prolonged standing may have welfare implications, particularly because of its relationship with lameness and reduced resting time.

Therefore, increased standing accompanied by reduced lying can serve as a useful behavioural indication of heat stress in dairy cows. However, these behavioural changes should not be interpreted in isolation. THI, core body temperature, time of day, season, housing conditions and cooling management should be considered together when assessing heat load and its effects on cow behaviour.

4. Beyond Heat Stress: What Else Makes a Cow Stand?

Cows may spend less time lying when the resting area is hard or wet, bedding is inadequate, stalls are poorly designed or too small, or there are not enough lying spaces for all the animals. These conditions can make it difficult for cows to rest comfortably (Tucker et al.,2021).

Housing system, feeding and milking schedules, lameness, weather and other management factors can all affect the amount of time cows spend lying. Therefore, reduced lying time should not automatically be considered a sign of heat stress or poor welfare. It is more appropriate to consider lying behaviour alongside the animal's health, environment, and management conditions (Tucker et al.,2021).

Providing a clean, dry and comfortable resting surface can therefore support normal lying behaviour.

5. Practical recommendation for farmers

- Provide housing management: Keep animals under a well-designed shelter during hot hours. The shelter should provide enough space, good ventilation and protection from

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direct sunlight. Proper shed orientation and height, suitable roofing materials, and adequate open space for ventilation can help maintain a cooler environment inside the shed (Singh et al., 2019).

- **Proper feeding management during hot weather:** Heat stress can reduce feed intake, so provide a more easily digestible diet that helps maintain nutrient intake during summer. During periods of extreme heat, avoid exposing grazing animals to peak daytime temperatures. Appropriate supplementation of dietary fat and optimisation of rumen undegraded protein can help support milk production and feed-use efficiency during hot weather. Consider antioxidant supplementation**,** Heat stress can cause oxidative stress. Vitamins such as vitamin C and vitamin E, along with minerals such as zinc, may be used as nutritional support under appropriate management. **Use feed additives where appropriate**, Yeast products may support nutrient digestion and rumen function during periods of heat stress (Singh et al., 2019).
- **Provide plenty of clean, cool drinking water**: Ensure that animals have sufficient access to drinking water, particularly during periods of high temperature (Singh et al., 2019).
- **Combine water cooling with air movement**: Sprinklers or misting combined with natural or forced air movement can improve cooling and help animals cope with heat stress (Singh et al., 2019).
- **Provide adequate electrolytes**: Electrolyte supplementation can help maintain acid–base balance and support animals during heat stress (Singh et al., 2019).
- **Combine management practices:** Heat stress is better managed by combining shade, adequate ventilation, sufficient water, cooling methods and appropriate nutrition, rather than relying on a single measure (Singh et al., 2019).

6. Conclusion

Changes in lying and standing behaviour can provide useful clues about dairy cows' heat load and comfort. Increased standing with reduced lying may occur during heat stress, but similar changes can also result from poor lying conditions, lameness, overcrowding, or other management factors. Therefore, farmers should observe animal behaviour regularly and consider it alongside the animal's environment, health, and management. Early recognition of behavioural changes, combined with timely cooling, adequate water, comfortable resting areas and appropriate nutritional management, can help animals cope better with heat stress and maintain productivity.

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