Behavioural Responses to Heat Stress in Sows and Current Regulatory Techniques used to Mitigate these Responses

Sows have a thermoneutral zone of around 15-20°C and will attempt to stay within their thermoregulatory limit using multiple strategies (Zhu et al., 2021). Physiological responses such as a change in respiratory rate or body temperature, and behavioural responses such as altering posture or feed and water intake all indicate a sows response to heat stress. Sow behaviour in response to heat stress is often studied by separating animals into treatment groups of varying environmental conditions and observing through use of multiple scientific sampling methods. The selected articles describe physiological and behavioural changes of sows to varying temperature conditions, as well as an investigation of regulatory strategies for mitigating heat stress in sows.

Sows will respond to changes in ambient temperature by adjusting how they respond to their environment. Muns et al (2016) were interested in observing the response of sows to an increased ambient temperature. They found that under heat-stressed conditions, sows will display an increased respiratory rate and body temperature, as well as changes to posturing and feeding behaviour. Upon investigating the impact of heat stress on feed intake and feeding behaviour, Quiniou et al (2000) found that sows housed at higher temperatures will consume fewer meals. These results are consistent with the results of Muns et al (2016), who also found that heat-stressed sows will have a lower feed intake. Sows will also respond to heat stress by altering their posture. In a recent study by Liu et al (2021), researchers investigated posture changes in response to increased ambient temperature. They found that the frequency of dynamic posturing such as sitting and standing in heat-stressed sows was lower than the control group, and that heat-stressed sows tended to shift their posture less often. These results are also comparable to Muns et al (2016), who found that heat-stressed sows spent the majority of their time in a lateral lying position.

Multiple studies have examined cooling systems that can help mitigate heat stress in sows. In a study by Cabezón et al. (2017), researchers examined the effect of floor cooling on sows experiencing acute heat stress. Based on observed reduced respiration rate and body temperatures, they concluded that cooling pads were an effective method for regulating heat stress. Similarly, Jeon et al (2006) evaluated the impact of chilled drinking water. They found that sows with access to cooled drinking water were also able to maintain lower respiration rates and surface temperatures, and deemed chilled drinking water another effective heat regulatory strategy. In a third study by Zhu et al (2021), the combined effects of floor cooling and chilled drinking water were examined. Though the previous two studies would support this method as an effective way to alleviate heat stress, heat-stressed sows in this study were still unable to downregulate their temperature to within their thermoneutral zone.

Researchers have also looked at altering housing systems in an effort to reduce heat stress in sows. In a study conducted by de Oliveira Júnior et al (2011), a standard farrowing crate was compared to a crate with floor cooling, as well as a semi-outdoor farrowing pen. Researchers found that sows with access to floor cooling or the outdoors displayed less heat stress, and rendered both housing systems as effective regulatory methods. Similarly, Devillers and Farmer

(2008) tested the use of a modified farrowing pen system with a free back area. They found that sows preferred the back area regardless of ambient temperature, which may be due to a number of factors.

The majority of the studies included in this review examined a sow's direct responses to heat stress as well as the corresponding effects on offspring performance. Research suggests that heat stress will decrease a sow's feed consumption and milk production, resulting in a litter with a lower weaning weight. This impact on piglet performance emphasizes the importance of strategies to mitigate heat stress and maximize animal welfare. In this way, further research is required to solidify an understanding of a sow's optimal thermal range and the most effective methods that can be employed to keep sows within this range. Bjerg et al. (2020) suggest further investigation into the combined effects of temperature, humidity, and air velocity on heat stress in sows.

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