

## Question to EURCAW-Pigs: Assessment of heat stress in pigs

23 June 2023

### Question

Received: 2 February 2023

EURCAW-Pigs received the following question from a welfare policy worker in one of the Member States:

- *Is it possible to assess the severity of heat stress in pigs (severe, mild, moderate)?*

Experts from EURCAW-Pigs wrote the reply. The EURCAW secretariat did the final editing. For queries: [info.pigs@eurcaw.eu](mailto:info.pigs@eurcaw.eu).

### Answers

In short, the answer is:

- The severity of distress cannot be distinctly divided into three categories. Open mouth panting and heavy abdominal breathing are, however, signs of severe heat stress.

### Background

Heat stress occurs when the environmental temperature is above the upper critical temperature (UCT) (see Figure 3.1.1 below from EURCAW-Pigs [Review on heat stress in pigs on farm](#) (Vermeer & Aarnink, 2023)).

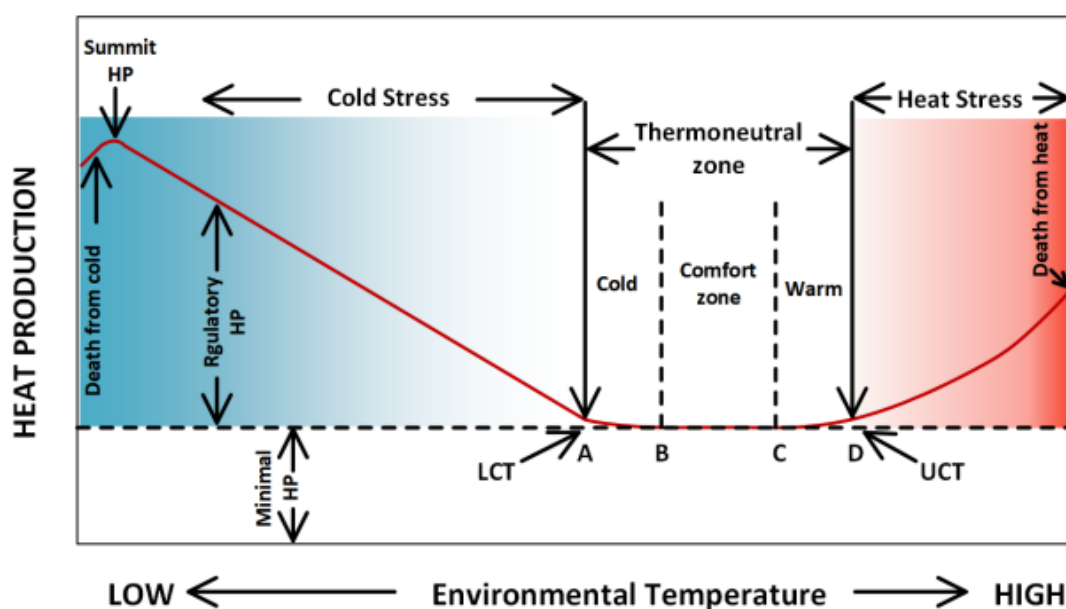


Figure. 3.1.1: The concept of thermal neutrality and thermal comfort (CT) (modified after Yousef, 1985). LCT=Lower Critical Temperature, UCT=Upper Critical Temperature; the red box marks the condition with heat stress; the capitals A-D are explained in the text below the figure.

In zone B – C (comfort zone) no effort is needed to balance heat loss with heat production. To compensate for the rising ambient temperatures, heat loss is kept at the same level mainly by lowering the skin resistance (vasodilatation).

In zone C - D (warm) heat loss is regulated by behavioural, e.g. lying on cool places (e.g. slatted floor instead of insulated solid floor) or on wet areas to increase convective, conductive and evaporative heat loss (behavioural thermoregulation), and physiological changes, e.g. small increase of respiration rate.

Above the UCT (>D, heat stress) high respiration rates and panting is shown as a sign of heat stress. Above point D, pigs will also lower their feed intake. In the zone from the upper threshold of the comfort zone (C) to the UCT as a limit of the thermoneutral zone (D), evaporative heat loss increases by increased respiration rate. At higher environmental temperatures, above the UCT, pigs show increased open mouth panting with more heavy abdominal breathing and a decreased voluntary feed intake.

It appears from the above that the severity of distress cannot be distinctly divided into three categories. Open mouth panting and heavy abdominal breathing are, however, signs of severe heat stress. The first phase of panting is characterised by rapid, shallow breathing called thermal polypnea, associated with an increase in respiratory rate. This shifts to a second phase characterised by slower and deeper breathing, named thermal hyperpnea characterised by an increase of alveolar ventilation rate (EFSA AHAW, 2022). Severe and prolonged heat stress can lead to fatigue and ultimately in death.

For more details on heat stress, see EURCAW-Pigs [Review on heat stress in pigs on farm](#) (Vermeer & Aarnink, 2023)) and EURCAW-Pigs [Review of climate control and space allowance during transport of pigs](#) (Bracke et al., 2020).

### Relevant references

Bracke, M. B. M., Herskin, M. S., Marahrens, M. A., Gerritzen, M. A., & Spoolder, H. A. M. (2020). *Review of climate control and space allowance during transport of pigs* (version 1.0). EURCAW-Pigs. Retrieved from <https://edepot.wur.nl/515292>

EFSA AHAW, 2022. *Welfare of pigs during transport*. <https://doi.org/10.2903/j.efsa.2022.7445>

Vermeer, H. M., & Aarnink, A.J.A. (2023). *Review on heat stress in pigs on farm* (version 1.0). EURCAW-Pigs. Retrieved from <https://edepot.wur.nl/587090>