Question to EURCAW-Pigs: Comfort Zone pigs
7 August 2023

Question
Received: 11 May 2023

EURCAW-Pigs received the following question from the Danish Veterinary and Food Administration:

> *"Heat stress is a major factor for discomfort in pigs and may also be the cause for tail biting. According to the Danish Welfare legislation for pigs it is required for all pigs above 20 kg including gilts and sows to have a misting system or a similar device installed in pens for group housing. The purpose is to give the pigs a possibility to regulate their body temperature by evaporation of moist from the skin. The official controls carried out in pig farms has revealed that some farmers do not use the misting system or only use it, when the pigs start showing signs of heat stress, such as panting, which in our opinion is too late. For this reason, the Danish Veterinary and Food Administration finds it necessary to introduce a legislative requirement, which makes it mandatory to use the misting system above a certain temperature as well.*
>
> *The use of the sprinkler is intended before the pigs experience heat stress. Therefore, we would like to know what the temperature limit is for pigs before they start to feel discomfort due to heat stress. Would it be the upper limit of the comfort zone, the upper limit of the thermo-neutral zone or somewhere in between? We are aware of the fact that it differs between age/weight categories.*
>
> *If possible, could we ask you to indicate threshold temperatures for the different categories from weaner pigs of 20 kg to finisher/slaughter pigs and for dry and pregnant sows? "*

Several EURCAW experts contributed to the response below. The EURCAW secretariat did the final editing, and may be contacted for queries: info.pigs@eurcaw.eu.

Answers
In short the answers are:

- Heat stress starts at the Upper Critical Temperature (UCT) of the thermoneutral zone (TZ);
- Reduced welfare (discomfort) starts earlier: from the UCT of the comfort zone (CZ);
- Sensitivity for heat stress can vary between pigs, so an individual pigs can experience heat stress from a lower temperature than the average pig;
- To prevent heat stress, a cooling system like a misting system to moisten the skin should be used from the UCT of the CZ as shown in Table 1.

Background
Loosing heat depends on many factors and is difficult for:

- large animals having a low skin surface to weight ratio;
- animals with a high feed intake and a high production;
- a high ambient temperature: a low difference in temperature results in less heat loss;

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- a high relative humidity, which makes evaporation more difficult;
- a low air speed;
- a bedded and/or solid floor compared to an open floor;
- a dry floor compared to a wet floor with wallowing option;
- a low space allocation and physical contact with penmates;
- individual characteristics.

As soon as the average pig in a pen reaches the Upper Critical Temperature (UCT) of the Comfort Zone (CZ = C in figure) one or more of the penmates is already "touching" the UCT of the Thermo-neutral Zone (TZ = D). To prevent more individual pigs from entering the heat stress zone it is important to start with cooling measures as soon as the average pig reaches the UCT of the CZ. See the general relation between heat/cold stress and temperature in Fig. 1 and for a finishing pig in Fig. 2. In table 1 the estimated UCTs are presented per pig category. For heavier finishing pigs (>60kg BW) this temperature is 20°C and for lactating sows this 18°C. The question is if a system as mentioned in the original question is suitable in a pen with both lactating sows and suckling piglets.
The term misting of fogging system is often used for a system to cool the incoming air outside the pig house, just before the air inlet. When the goal is to moisten the skin of the pigs directly or indirectly (wallowing on the floor) we often use the word sprinkling or showering.

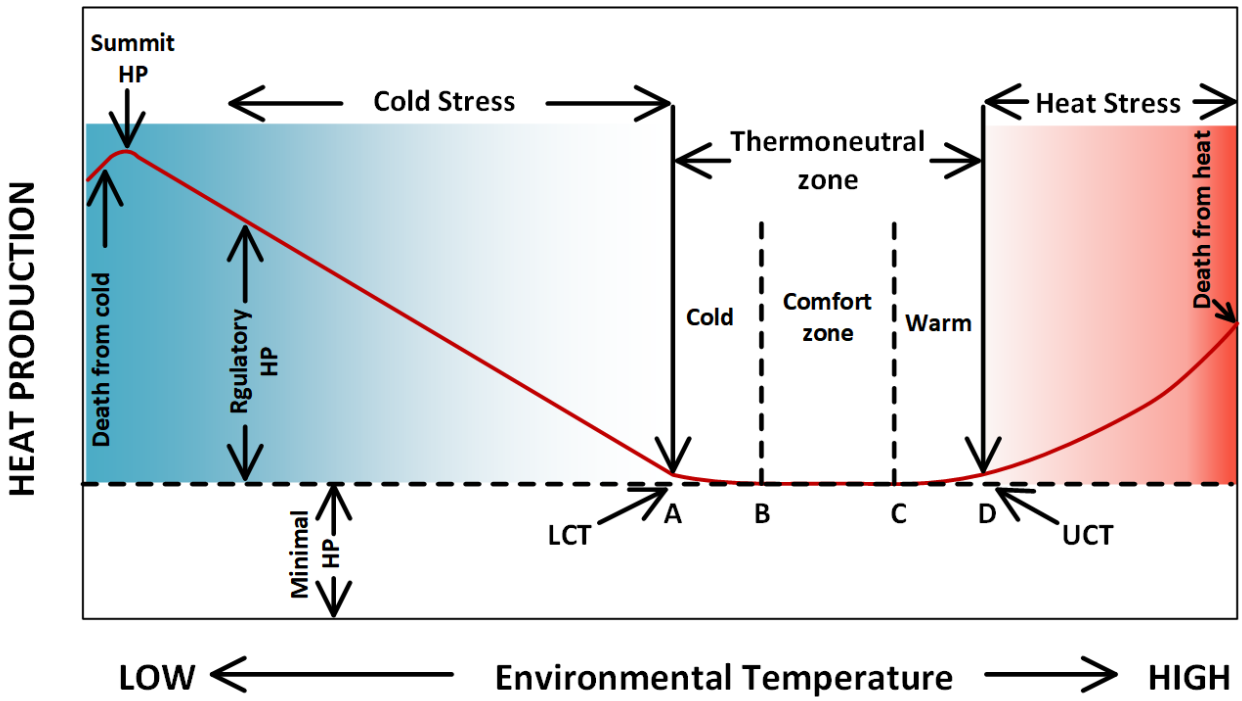

Fig 1. Diagram showing the general relation between environmental temperature and heat/cold stress risk for an animal

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in accordance with Articles 95 and 96 of Regulation (EU) 2017/625.

Table 1. Indication of the upper critical temperatures (UCT) of the comfort zone and of the thermo-neutral zone (in °C) of the different categories of pigs (adapted from Sterrenburg and Van Ouwerkerk, 1990).

Pig category	UCT Comfort Zone (°C)	UCT Thermo-neutral Zone (°C)
Piglet 8 kg	**31**	35
Piglet 20 kg	**26**	30
Grower 30 kg	**24**	28
Finisher >60 kg	**20**	25
Empty sow	**25**	29
Pregnant sow	**23**	26
Lactating sow	**18**	21

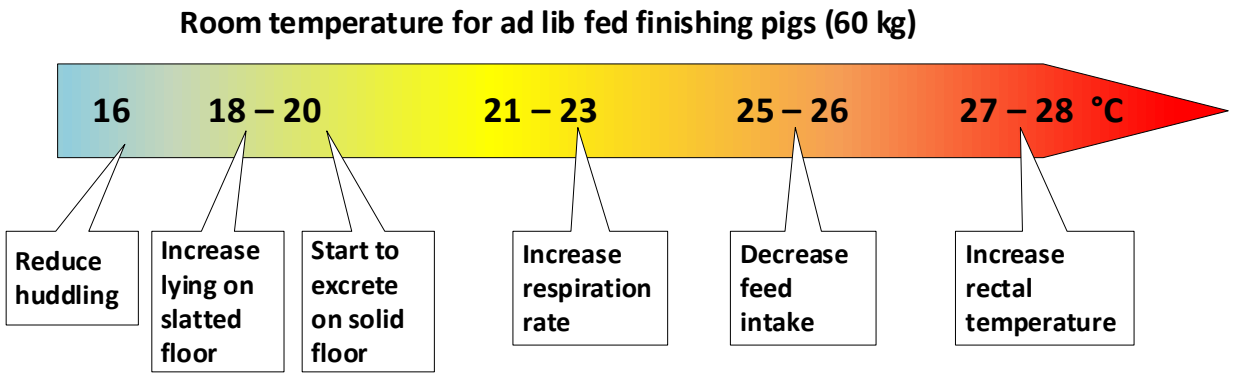

Fig 2. Diagram showing the relation between room temperature and behaviour of a an ad lib fed finishing pig (60 kg)

Legal standards COUNCIL DIRECTIVE 2008/120/EC

Annex I, Chapter I, Article 3: The accommodation for pigs must be constructed in such a way as to allow the animals to:

*- have access to a **lying area physically and thermally comfortable** as well as adequately drained and clean which allows all the animals to lie at the same time.*

Relevant references

Vermeer, H.M. and Aarnink, A.J.A. (2023). Review on heat stress in pigs on farm. EURCAW Pigs Review, 17 p. https://edepot.wur.nl/587090

Sterrenburg, P. & Van Ouwerkerk, E. N. J. (1990). Rekenmodel voor de bepaling van de thermische behaaglijkheidszone van Varkens - BEZOVA (Model to determine the thermal comfort zone in pigs - BEZOVA). Rapport 78, IMAG Wageningen, 21 pp

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