EU Reference Centre for Animal Welfare *Pigs*

Indicator factsheet Heat stress on farm & during transport

Increased respiratory rate

heat stress

What does respiratory rate indicate?

- Changes in **respiratory rate (RR)** and **panting** are thermoregulatory behaviours which can indicate heat stress. Pigs have a very limited number of functional sweat glands. Therefore, the major way pigs thermoregulate is via behavioural adaptation, e.g. increase in RR.
- Some pig categories like sows are more vulnerable to heat stress due to large body size, relative low surface area: body weight ratio, higher energy intake (lactation), and high subcutaneous fat tissues.
- High humidity will aggravate heat stress due to the reduced ability of pigs to use evaporative cooling (e.g. by panting).
- Although pigs can lose some heat via radiation, conduction, or convection, to do so, pigs require more space (e.g. to lie in lateral recumbency) or other cooling devices (e.g. shower, and/or wallowing areas).
- The **upper limit of the comfort zone (TCZ)** and the upper limit of the **thermoneutral zone (UCT)** are given in the table. As the pigs have an increased heat production during transport (e.g. balancing) and have only limited possibilities to cool down on trucks, the values according to EFSA's Opinion on Transport for pigs (2022)* are partly below those for husbandry. As sows can be transported in almost any production stage, the lowest thresholds are estimated for transportation of sows. All values are estimates and may vary depending on other factors.

Pig category	TCZ	TCZ*	UCT	UCT*
Piglet 8 kg	31 °C		35 °C	
Piglet 20 kg	26 °C		30 °C	
Grower 30 kg	24 °C	24 °C	28 °C	24 °C
Finisher >60 kg	20 °C	22 °C	25 °C	25 °C
Dry sow	25 °C	20 °C	29 °C	22 °C
Pregnant sow	23 °C	20 °C	26 °C	22 °C
Lactating sow	18 °C	20 °C	21 °C	22 °C

Legal requirements

Council Directive **2008/120/EC**: General conditions
{Annex I, Chapter I, Article 3}: Lying area physically and thermally comfortable
Directive 98/58/EC Annex: Buildings and accommodation
{Article 10}: temperature, relative air humidity [...] must be kept within limits which are not harmful to the animals
Council Regulation **EC 1/2005**: Requirements associated with climate comfort are specified in:
{Articles 3-6}: planning, considering weather conditions
{Annex I, Chapter II, Article 1}: vehicle
{Annex I, Chapter III, Article 2.6}: ventilation
Further requirements during long transports (> 8 hours):
{Annex I, Chapter VI, Article, 1.2}: bedding
{Annex I, Chapter VI, Article 3.1}: range of temperature
{Annex I, Chapter VI, Article 3.2}: ventilation
{Annex I, Chapter VI, Article 3.3}: temperature monitoring system
{Annex I, Chapter VI, Article 3.4}: temperature warning system

Note: Listed requirements are paraphrasing the literal text of the regulation and are not comprehensive. Moreover, there might be stricter national legislation in place. For a more detailed description on the specific requirements, see the Reviews Transport of sows, Climate control and space allowance during transport of pigs and Heat stress

Inspection method (recommended)

- On farm and during pig transport temperature and humidity should be recorded. Records should be made available on request of the inspector. Further, the driver checks pigs for their respiration rates and sign of panting (open mouth breathing) during stops and at arrival.
- The official inspector checks if pigs have an increased respiration rate or show panting during the visit on farm, or during stops and at arrival.
- The inspector reports findings to the farmer or the transporter, and in case of discrepancies between legal requirements and situation corrective actions are taken to ensure the situation complies with legal requirements in the future.

Increased respiratory rate

Assessment method

The inspector should check for increased respiratory rate (RR) in a selection of pens focusing on most risky situation: heavier pigs and/or pigs with the highest feed intake (e.g. lactating sows), or at all decks of the transport vehicle during road checks and at slaughterhouse inspections. To inspect pigs on a truck, the inspector should organize a ladder to look at the middle and upper decks and at different areas of the truck in the front, middle and rear. He or she should count/estimate the number of breaths per minute for some of the animals.

Physiological RR

The respiratory or respiration rate is the rate at which breathing occurs; it is set and controlled by the respiratory center of the brain. It is assessed by the number of breaths per minute. All values are estimates.

Pig category	Physiological RR
Newborn	50-60
Weaned pig	25-40
Growing pig	30-40
Finishing pig	25-35
Sow	~ 26

Scan the QR code to watch a video of a pig breathing in a physiological pattern.

Increased RR and Panting

Rapid shallow breathing accompanied with an increased respiratory rate, is often the first phase of panting. In the second phase the breathing pattern shifts to a slower and deeper breathing characterized by an increase of alveolar ventilation rate.

A controlled increase in respiratory rate accompanied by a decrease in tidal volume/increase in ventilation of the upper respiratory tract is defined as 'panting'.

Scan the QR code to watch a video of a sow with an increased respiration rate.

Sources: Brown-Brandl et al. (2001); Bjerg et al. (2020); Collier & Gebremedhin (2015); EFSA (2022)

Additional checks

To check if the basic requirements for pigs' thermal comfort are met, measure the outdoor temperature, assess the ambient temperature in the pen and inside the vehicle. It is recommended to measure the temperatures close to the presumably hottest place in the pens or in the vehicle and close to the animals, i.e. as far away from the ventilation openings and the expected air flow as possible.

Note that a temperature monitoring system needs to be in place for transports > 8 hours. When the ambient temperature and humidity levels are high and an animal is panting, it is likely that the animal is experiencing heat stress. If ambient temperature and humidity levels are low and an animal is panting, then this behaviour can also be caused by physical exertion or illness.

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