
Question to EURCAW-Pigs: Flooring for weaners

03 June 2021

Question

Received: 14 April 2021

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

What is known about the relative comfort for lying of weaner piglets of different floor types for the lying area: plastic, solid, rubber mats, etc.

Answers

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.

In short the answers are:

- Weaned piglets prefer a solid floor for lying.
- Under thermoneutral conditions, weaners prefer a soft top layer for resting.
- Solid floors with bedding lower the risk for injuries due to insufficient lying comfort.
- Microclimate in the lying area should adapt to the changing thermal comfort zone of piglets during rearing period.
- At ambient temperatures above the thermoneutral zone piglets choose a cooler lying area and accept a less comfortable lying surface.
- At a space allowance of 0.3 m² per pig of 25 kg bodyweight the space required for lying is more than 70% of the pen surface.
- Additional advantages of a solid lying floor: lower emissions (when dry and clean), less draught, provision of enrichment easier.

Background

Pigs in general separate their functional areas, so they try to keep their lying area dry and clean (EFSA, 2005). Piglets prefer to lie together as a group in a nest within their thermoneutral zone (EFSA, 2005), which for weaners is roughly between 20 and 32 °C depending on weight (age) and feed intake (Muirhead et al., 2013). When temperatures fall below the piglet's thermoneutral zone the sternal lying position and huddling can be most frequently observed. At temperatures above the thermoneutral zone lateral lying without physical contact with pen mates is the dominant lying behaviour. At thermoneutral temperatures pigs prefer lying on a solid floor and at higher ambient temperatures a cooler lying area like a slatted and/or wet floor is preferred (Vermeer et al., 1995).

Lying comfort

The few scientific publications on lying comfort are mainly based on preference tests for lying. Weaners prefer a solid floor over slatted floor for lying (EFSA, 2005). In case of solid floor in the lying area pigs prefer some soft bedding material like litter, a soft mattress (1 cm) or a waterbed over a bare concrete floor (Wijhe-Kiezebrink et al., 2013). Vasdal et al. (2009) compared saw dust, a foam mattress and a water bed in the lying area of suckling pigs with a clear preference

for saw dust. In case of slatted floor in the lying area, Farmer et al. (1982) and Pouteaux et al. (1983) found a preference of piglets for plastic expanded metal slatted floor over molded plastic or metal slatted floors. This indicates that weaners prefer a soft top layer for resting under thermoneutral conditions and only change to less preferred (uncomfortable) floors in case the ambient temperature does not meet their thermal requirements.

Impact of floors on the occurrence of lesions

Comparisons between floor types often consider the occurrence of lesions in pigs. For instance, pigs can develop bursae (bursitis) on hard floors. These cannot easily be seen in young pigs and are mainly found in older finishing pigs (Gillmann et al., 2008; Mouttotou et al., 1998). Lactating sows can develop shoulder wounds on the hard floor of the farrowing pen especially with low body condition scores (Bonde et al., 2004), when the bones are less well covered with e.g. fat tissue. For suckling piglets, a soft floor reduced lesions on carpal joints (Phillips et al., 1995) that may develop as piglets are trying to get access to the teat when suckling. Metal floors in general increase lesions on claws and carpal joints of suckling piglets compared to plastic coated expanded metal (Lewis et al., 2005). A smooth surface, especially when using solid concrete floors is essential to prevent abrasions in suckling piglets (Zoric et al., 2009).

Thermal comfort

The optimal air temperature for weaned piglets during the rearing period lies between 20-32°C (Muirhead et al., 2013). This optimal temperature goes down. In the first week after weaning, piglets have a demand for higher temperatures (i.e. around 30°C) due to a low feed intake and low body weight. To avoid losing heat through conductivity, young piglets should be housed on a solid or on a plastic floor, as opposed to a metal slatted floors. Polypropylene and Polyurethane have a thermal conductivity between 0.1 and 0.5 W/mK, whilst steel has a thermal conductivity of 35 W/mK (https://en.wikipedia.org/wiki/List_of_thermal_conductivities). Other ways to keep piglets warm during the first critical week are floor heating, a (suspended) heat source or a creep area with bedding material. At the end of the rearing period, their optimal temperature is a lot lower. When it gets too warm, even less comfortable floors such as metal or wet floors are used for cooling. A wet concrete floor feels 5°C colder than a dry concrete floor (Baker, 2005). To meet the changing thermal needs for comfortable lying, a floor heating and cooling system can be included in solid floors. Alternatively, a removable cover and heater above the lying area can also be used (Opderbeck, 2021).

According to Dutch guidelines, the room temperature of rooms with partly slatted floors including floor heating can be 2°C lower than in rooms with fully slatted systems (Klimaatplatform, 2021).

Space needed in lying area

Pigs need a space for lying in half-recumbency which can be estimated through the formula $0.027 * \text{Bodyweight (BW)}^{0.67}$ (according to Petherick (2007)). At 25 kg BW this results in 0.23 m² per pig. The legal minimum for total space allowance according to EU Directive 2008/120/EC is stepwise and is 0.3m² per pig between 20 and 30 kg BW. Figure 1 shows that the percentage of physical lying space needed between 20 and 30 kg BW is between 70 and 85% of the total area required by the legislation. The area of the pen which is suitable for lying should not be less than 70% to guarantee each pig a comfortable lying area in this weight range. Thus, in case of multiple floor types within a pen the majority of the surface should be suitable for lying.

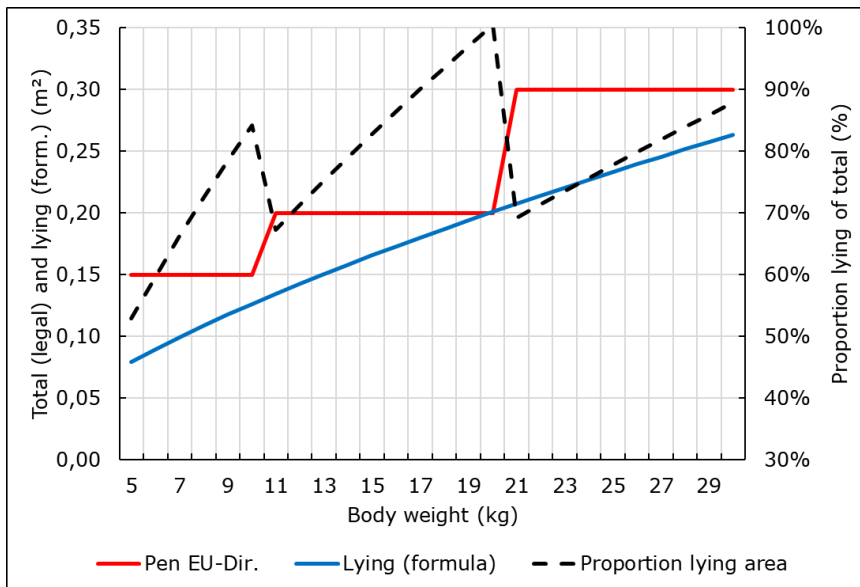


Figure 1. Space allowance per weaner necessary for semi recumbent lying (blue)(based on Petherick, 2007), for total area according to EU Directive (red) and the proportion of lying area of the total area (black dashed).

Legal standards (EU Directive 2008/120/EC)

Weaner piglets are piglets from weaning until 30 kg liveweight. Until 10 kg 0.15m² floor area per pig is required, until 20 kg 0.20m²/pig and until 30 kg 0.30m²/pig. This floor is both for lying and for activities like walking, eating, elimination and exploration. The floor type can differ depending on functional area.

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,
- rest and get up normally,
- see other pigs; however, in the week before the expected farrowing time and during farrowing, sows and gilts can be kept out of the sight of conspecifics.

Pigs must have permanent access to a sufficient quantity of material to enable proper investigation and manipulation activities, such as straw, hay, wood, sawdust, mushroom compost, peat or a mixture of such, which does not compromise the health of the animals.

Floors must be smooth but not slippery so as to prevent injury to the pigs and so designed, constructed and maintained as not to cause injury or suffering to pigs. They must be suitable for the size and weight of the pigs and, if no litter is provided, form a rigid, even and stable surface.

Relevant references

Baker, J.E. (2004) Effective environmental temperature. *J. Swine Health Prod.*, 12, 140-143.

<https://www.aasv.org/shap/issues/v12n3/v12n3ptip.html>

Bonde, M., Rousing, T., Badsberg, J. H., Sørensen, J. T. (2004). Associations between lying-down behaviour problems and body condition, limb disorders and skin lesions of lactating sows housed in farrowing crates in commercial sow herds. *Livest. Prod. Sci.*, 87, 79-187.

<https://doi.org/10.1016/j.livprodsci.2003.08.005>

EFSA (2005). The welfare of weaners and rearing pigs: effects of different space allowances and floor types. *The EFSA Journal*, 268, 1-19.

<https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/j.efsa.2005.268>

EC (2008). Council Directive 2008/120/EC. *Official Journal of the EU*. 18-2-2009, L47/5-13.

<http://edepot.wur.nl/146801>

Farmer, C., Christison, G.I. (1982). Selection of perforated floors by newborn and weanling pigs.

Can. J. Anim. Sci., 62, 1229-1236. <https://cdnsiencepub.com/doi/abs/10.4141/cjas82-143>

Fraser, D., Matthews, L.R. (1997). Preference and motivation testing. In: M.C. Appleby & B.O. Hughes (Eds.). *Animal Welfare*. New York: CAB International, 159-173.

<https://www.wellbeingintlstudiesrepository.org/valaexp/2/>

Gillmann, C.E., KilBride, A.L., Ossent, P., Green, L.E. (2008). A cross-sectional study of the prevalence and associated risk factors for bursitis in weaner, grower and finisher pigs from 93 commercial farms in England, *Prev. Vet. Med.*, 38, 308-322.

<https://doi.org/10.1016/j.prevetmed.2007.09.001>

Klimaatplatform (2021). Richtlijnen klimaatinstellingen (Guidelines settings for climate control), version Feb 2021. Accessed May 2021. <https://www.wur.nl/nl/show/Richtlijnen-klimaatinstellingen-varkenshouderij.htm>

Lewis, E., Boyle, L.A., O'Doherty, J.V., Brophy, P., Lynch, P.B. (2005). The Effect of Floor Type in Farrowing Crates on Piglet Welfare. *Irish J. Agric. Food Res.*, 44, 69-81.

<https://www.jstor.org/stable/25562533>

Mouttotou, N., Hatchell, F.M., Green, L.E. (1998). Adventitious bursitis of the hock in the finishing pigs: prevalence, distribution and association with floor type and foot lesions. *Vet. Rec.* 142, 109-114. <https://doi.org/10.1136/vr.142.5.109>

Muirhead, M.R., Alexander, T.J.L., Carr, J. (Ed) (2013). *Managing Pig Health: A Reference for the Farm - 2nd Edition*. 5M Publishing, United Kingdom, 704p. <https://www.thepigsite.com/pig-management/environmental-management/environmental-temperatures>

Nielsen, N-P., (1999). Spaltegulve til smågrisestalde Landsudvalget for Svin, Videncenter for Svineproduktion, Den rullende Afprøvning, Meddelelse 414 x.

https://svineproduktion.dk/Publikationer/Kilder/lu_medd/medd/414.aspx

Petherick, J.C. (2007). Spatial requirements of animals: Allometry and beyond. *J. Vet. Behav.*, 2, 197-204. <https://doi.org/10.1016/j.jveb.2007.10.001>

Opderbeck, S., Keßler, B., Gordillio, W., Schrade, H., Piepho, H.-P., Gallmann, E. (2021). Influence of cooling and heating systems on pen fouling, lying behaviour, and performance of rearing piglets, *Agric.*, 11, 324. <https://doi.org/10.3390/agriculture11040324>

Peet-Schwering, C.M.C. van der, Aarnink, A.J.A., Rom, H.B., Dourmad, J.Y. (1999). Ammonia emissions from pig houses in The Netherlands, Denmark and France. *Livestock Production Science*, 58(3), 265-269. [https://doi.org/10.1016/S0301-6226\(99\)00017-2](https://doi.org/10.1016/S0301-6226(99)00017-2)

Pflanz, W., Hahn, B., Lenkner, G., Wiedmann, R. (2009). Welcher Boden für Saug- und Aufzuchtferkel? Bildungs- und Wissenszentrum Boxberg, Report April 09, 5p. https://lsz.landwirtschaft-bw.de/pb/site/pbs-bw-mlr/get/documents_E415497618/MLR.LEL/PB5Documents/lsz/pdf/f/Ferkelb%C3%B6den.pdf

Phillips, P.A., Fraser, D., Pawluczuk, B. (1995). Effects of cushioned flooring on piglet leg injuries. *Transactions of the ASAE.*, 38, 213-216. <https://doi.org/10.13031/2013.27832>

Pouteaux, V.A., Christison, G.I., Stricklin, W.R. (1983). Perforated-floor preference of weanling pigs. *Appl. Anim. Ethol.*, 11, 19-23. [https://doi.org/10.1016/0304-3762\(83\)90075-5](https://doi.org/10.1016/0304-3762(83)90075-5)

Vasdal, G., Møgedala, I., Bøea, K.E., Kirkden, R., Andersen, I.L. (2009). Piglet preference for infrared temperature and flooring. *Appl. Anim. Behav. Sci.*, 122, 92-97. <https://www.sciencedirect.com/science/article/pii/S0168159109003529>

Vermeer, H.M., Altena, H., Vrielink M.G.M. (1995). Vloeruitvoering en hokbevuiling bij gespeende biggen (Floor design and dirtiness in pens for weanling piglets). *Praktijkonderzoek Varkenshouderij (Research Institute for Pig Husbandry)*, Rosmalen, The Netherlands, Research Report P1.138, 19p. <https://library.wur.nl/WebQuery/wurpubs/fulltext/27535>

Wijhe-Kiezebrink, M.C. van, Peet-Schwering, C.M.C. van der, Classens, P.J.A.M., Hoofs, A.I.J., Binnendijk, G.P. (2013). Pilotproef type ligvloer voor gespeende biggen (Pilot study lying floortype for weaners). Wageningen UR Livestock Research, Internal Report 201306, 19p.

Zoric, M., Nilsson, E., Lundeheim, N., Wallgren, P. (2009). Incidence of lameness and abrasions in piglets in identical farrowing pens with four different types of floor. *Acta Vet Scand.*, 51, 23. <https://doi.org/10.1186/1751-0147-51-23>