

THE IMPORTANCE OF FLOOR RAILS FOR THE SOW'S CHOICE OF Lying Position AND THE SUCKLING PIGLETS' POSITION AT THE UDDER

Vivi Aarestrup Moustsen and Mai Britt Friis Nielsen

SEGES Innovation P/S, Field Trials

STØTTET AF

Svineafgiftsfonden

Main Conclusion

This is a small-scale study based on field observations, and therefore no definitive conclusions could be drawn. However, the floor bar did not appear to bother the piglets, and while no sows were observed rolling in pens with floor bars, they did stand up and turn around more frequently.

Summary

In this pilot study, observations were made for risk situations where the sow rolled over the piglets. In addition, the piglets' access to the udder was observed.

There was insufficient data to draw statistically reliable conclusions. The sows observed via video in pens with floor rails did not roll over the piglets but stood up and turned around more frequently than sows in risk pens without floor rails. In the observed pen type, the inner diameter of the safety ring was 115 cm. Based on the video recordings, there were a significant number of instances where the piglets' access to the udder/teat was thereby restricted. It is recommended that, in the future, the distance be increased to reduce the number of times the floor bar obstructs the piglets.

In the case of free-range lactating sows, there is a challenge posed by higher piglet mortality compared to sows in crates. A significant portion of the mortality is due to crushing, where the sows, when lying down or rolling onto their sides, crush the piglets.

Background

If sows are free-range during farrowing and also during the lactation period, piglet mortality is usually higher than when sows are housed in crates [1]. Since a significant portion of piglet mortality occurs even before litter equalization [2], it is recommended that the sows' movement be restricted during farrowing. It may therefore be relevant to evaluate alternatives to pens to limit the sow's risky behavior. The primary risk situations arise when sows lie down and when they roll [3]. The risk associated with lying-down situations can, for example, be reduced if sows lie down with support [3; 4]. Previous attempts have been made

to reduce the risk associated with rolling behavior by altering the slope of the floor, which reduced the number of piglets trapped under the sow but simultaneously altered the sows' choice of lying position [5].

A Danish pig producer has, over a number of years, worked on housing design measures that can increase piglet survival in farrowing pens for free-range sows. Previously, pens from the same producer were included in a SEGES test, "Test of Ten Pen Types for Free-Range Lactating Sows" [6], which included the pen (Wellfair pen) with a safety ring and pendulum (see Figure 1).



Figure 1: Photo of a farrowing pen for free-range sows with a danger ring and pendulum (Wellfair-pen).

The WellFair-Pen was developed for free-roaming, lactating sows [6], without the use of a pen that restricts the sow's movement. The floor bar included in this experience-gathering study was developed and used in the WellFair-Pen as a replacement for the pendulum to reduce the incidence of rolling behavior in free-range lactating sows, as rolling behavior has previously been shown to be critical for the piglets.

Materials and Methods

The study was conducted in a herd of 185 sows and full-line production of approximately 5,500 market hogs annually. In this study, one farrowing pen was allocated per section. A total of ten sows were video-recorded. Dry feed was used in the farrowing barn.

Two groups were included: one group did not have a floor rail (control group) (see Figure 2), and the other group had a floor rail (experimental group) (Figure 3). The distinctive feature of the new floor rail was:

- it took up only a limited amount of space in the pen
- it was movable
- it was believed to reduce the sow's ability to roll and, consequently, to crush piglets while rolling.

A total of five sows were included in the control group and five sows in the experimental group (Table 1). In both groups, there was a safety ring around the solid floor in the pens. The floor bar used in the experimental group was designed for the farrowing pen with a safety ring.



Figure 2: Photo of a farrowing pen for free-range sows with a safety ring and without a floor bar (Wellfair pen).

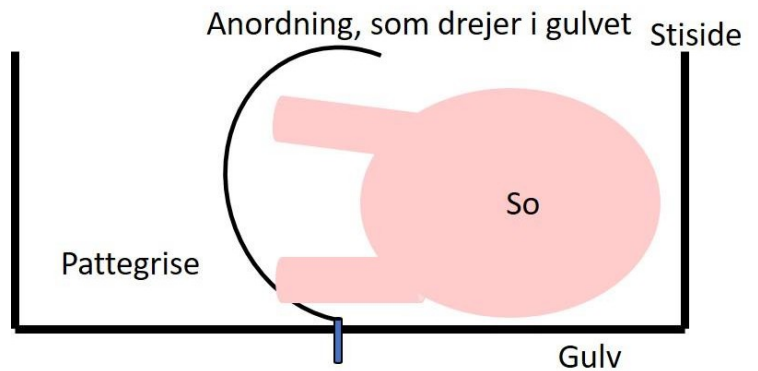


Figure 3: Sketch of a farrowing pen for free-range sows with a hazard ring and floor bar (Wellfair pen).

Table 1. Overview of pens in the data collection, averages supplemented with (median; min; max).

	No floor bar Control group	Floor bar Experimental group
Number of sows, pcs.	5	5
Litter number	4.4 (3;1;12)	3.8 (4;3;5)
Live births, number per litter	18.8 (21;14;23)	20.4 (22;15;23)
Stillbirths, number per litter	1.4 (1;0;4)	2.4 (2;1;4)

Video cameras were installed in 12 pens with floor rails and eight pens without floor rails. Video was recorded from two days before the expected farrowing date until weaning. SEGES compiled an ethogram (an overview of behavioral observations; Table 2) and subsequently recorded the sow's movements based on the video recordings.

The function of the floor rail was assessed over a 24-hour period for the sow and piglets when the piglets were 0, 7, 14, 21, and 28 days old, respectively (Table 2). The early period (days 1 and 7) was chosen because the sow's crushing of piglets most often occurs at the start of the nursing period. The later period (days 14, 21, and 28) was assessed to determine whether space constraints arose at the sow's udder as the piglets grew larger.

Table 2. Overview of observed behaviors for sows and piglets, respectively (etogram).

Animal group	Observed behavior
Sow	Sow lies down in the safety ring
	The floor rail is in the way of the sow as she lies down ¹
	Sow rolls from a prone position ² to a side-lying position
	So, roll from the side position to the prone position ²
	So moves from the prone position ² to the side-lying position without rolling ³
	The dog moves from a side-lying position to a prone position ² without rolling ³
	Stop – stands up, turns around, stands, or sits
Piglets	Piglets trapped between the floor bar and the sow
	A piglet cannot reach the udder due to the floor bar (less than 5 cm between the floor bar and the udder) ⁴
	Piglet trapped in the danger zone

¹ Sow attempts to lie down 2–3 times; floor bar strikes sow on the belly

² When lying on her belly: neither shoulder touches the floor

³ “Without rolling” means that the sow “shifts” from, for example, a side-lying position to a belly-down position, that is, in several small movements compared to “rolling,”

which is a continuous movement

⁴ The piglet attempts to reach the udder (behind the floor bar) 2–3 times, and then moves on without reaching the udder.

Data Analysis

This was a pilot study/data collection effort. The groups were thus compared without prior power calculation. The expectation was that sows, when lying on the solid floor in pens with a floor rail, would roll fewer times or not at all from a side-lying position on one side to a belly-down position and then to a side-lying position on the other side in pens with a floor rail (especially from side to side) compared to sows in control pens where there was no floor rail. The primary measurements were thus the number of rollovers when the sows were lying on the solid floor.

Results and Discussion

As expected, the floor rail reduced the free-range sows’ ability to roll, but at the same time, it was found that the floor rail could limit piglets’ access to the udder (Table 3).

On average, 10.7 lying-down events per sow per day were recorded in the control pens and 14.1 lying-down events per sow per day in pens with a floor bar. In the control pens, piglets were pinned by the sow more often than in the experimental pens when the sow was lying in the danger zone. This is likely because protection for the piglets inside the danger zone was only present in the pens with floor rails.

Table 3. Overview of sow behavior; all five observation days are listed with the total frequency of selected behavioral elements and situations for sows in control pens and sows in pens with floor rails, respectively.

	Control	Floor Bar
When lying down on a solid floor—and in pens with a floor bar—the number of times the floor bar is in the sow's way while she is lying down is recorded	-	1
Number of rollover situations from prone to lateral position when the sow is lying on a solid floor	54	2
Number of times piglets are trapped between the floor rail and the sow	-	0
Number of times piglets' access to the udder is restricted ¹	0	99
Number of times piglets are pinned by the sow when the sow is in the danger zone	6	3

¹ For example, if it is estimated that there is less than 5 cm between the floor bar and the udder/teats, making it difficult for the piglets to latch on.

It was observed that sows lay down more frequently on Day 0 than on the other observation days ($P=0.003$) and that no sows in pens with floor rails rolled over as the sows in the control group did ($P=0.02$). A significant difference was also observed in the frequency with which sows turned from their side to their belly without rolling between the two groups ($P=0.003$) (Table 4).

Table 4. Overview of the frequency of selected behavioral elements and situations for sows in control pens and sows in pens with floor rails, respectively, recorded on days 0, 7, 14, 21, and 28.

Group	Day	Control	Floor Bar	P-value Day*Group	P-value day	P-value group
Settles	0	17	19	0.63	0.003	0.27
	7	9	13			
	14	9	16			
	21	11	12			
	28	7	9			
Roll, both from front to side and from side to front ¹	0	5	0	0.02	0.02	0.02
	7	3	0			
	14	2	0			
	21	3	0			
	28	2	0			
Transition from prone to side-lying position without rolling ²	0	5	9	0.98	0.39	0.003
	7	6	10			
	14	5	11			
	21	7	12			
	28	3	7			
Transition from side-lying to prone position without rolling ²	0	3	7	0.21	0.11	0.45
	7	3	4			
	14	2	3			
	21	5	4			
	28	1	3			

¹ "Rolling" refers to a continuous movement.

² "Without rolling" means that the sow "shifts" from, for example, a side-lying position to a belly-down position, that is, in several small movements

No piglets became trapped between the floor bar and the sow. In both groups, there were piglets that became trapped between the sow and the safety ring. There were a significant number of instances where the floor bar restricted one or more piglets' access to the udder in the pens with floor bars (Table 5).

no weight gain was recorded; therefore, the impact of the floor bar reducing access to the udder or teats could not be quantified. In the observed pen type, the interior dimension of the safety ring was only 115 cm. To ensure sufficient space for the sow and, most importantly, for the piglets in pens with a floor bar, it is recommended that this distance be increased. Based on the dimensions of Danish crossbred sows (70 cm from the back to below the udder) [7] and the requirement that the sow be able to lie on both sides of the bar, the recommended internal dimension is 140 cm to reduce the number of instances where the floor bar obstructs the piglets. There were not enough observations to allow for a statistical comparison between the control and experimental groups regarding the number of situations in which piglets were trapped in high-risk situations (Table 5).

Table 5. Overview of the frequency of selected risk situations for piglets in pens with sows in control pens and sows in pens with floor rails, respectively.

Group	Day	Control	Floor Bar
Number of times piglets were trapped between the floor bar and the sow	All	0	0
Number of times piglets' access to the udder was restricted ¹	0	0	28
	7	0	8
	14	0	23
	21	0	29
	28	0	11
Number of times piglets are crushed by the sow when the sow is in the danger zone	0	6	3

¹ For example, if it was assessed that there was less than 5 cm between the floor rail and the udder/teats, making it difficult for the piglets to latch on.

The floor rail took up limited space in the passageway. It may therefore be worthwhile to assess whether it can be installed in other types of passageways leading to open pens and, in doing so, reduce the pigs' rolling behavior and thus the risk of piglets becoming trapped.

Conclusion

This was a small-scale study, and therefore no definitive conclusions could be drawn. However, the floor bar did not appear to bother the piglets, and no sows were observed rolling in pens equipped with the floor bar. There were instances where one or more piglets' access to the udder was restricted by the floor bar. The extent of this potential drawback should be investigated on a larger scale, preferably in multiple types of farrowing pens for free-range sows and where the distance to the floor bar is greater.

References

- [1] Goumon, S.; Illmann, G.; Moustsen, V.A.; Baxter, E.M.; Edwards, S.A. 2022. Review of temporary crating of farrowing and lactating sows. *Frontiers in Veterinary Science* doi: 10.3389/fvets.2022.811810
- [2] Hales, J.; Moustsen, V.A.; Nielsen, M. B. F.; Hansen, C.F. 2016. The effect of temporary confinement of hyperprolific sows in Sow Welfare and Piglet Protection pens on sow behavior and salivary cortisol. *Applied Animal Behavior Science*, 183, 19–27.
- [3] Damm, B.I.; Forkman, B.; Pedersen, L.J. 2005. Review: Lying down and rolling behavior in relation to piglet crushing. *Applied Animal Behavior Science*, 90, 3–20
- [4] Damm, B.I.; Moustsen, V.; Jørgensen, E.; Pedersen, L.J.; Heiskanen, T.; Forkman, B. 2006. Sow preferences for walls to lean against when lying down. *Applied Animal Behavior Science*, 99, 53–63 doi: 10.1016/j.applanim.2005.09.014

- [5] Danholt, L.; Moustsen, V.A.; Nielsen, M.F.; Kristensen, A.R. 2011. Rolling behavior of sows in relation to piglet crushing in pens with sloped versus level floors. *Livestock Science*, 141, 59–68 doi:[10.1016/j.livsci.2011.05.005](https://doi.org/10.1016/j.livsci.2011.05.005)
- [6] Hansen, L.U. (2018). Product testing of ten different farrowing crates for free-range sows. *Experience 1803*. SEGES Pig Production, 35 pp.
- [7] Moustsen, V.A.; Nielsen, MFB; Nielsen, S.E.; Kristensen, A.R. (2017). Danish sows have the same height, length, width, and depth as in 2003. *Bulletin 1113*. SEGES Pig Production, 9 pp.

Participants

Technician: Erik Jeppesen, student assistant Clara Nyegaard-Signori

Test No. 1759

NAV No.: 1424

//JAHP//

Animal group: Sows, piglets
Subject area: Housing design,
farrowing pens
Keywords: Sow behavior,
lactation

SEGES
INNOVATION

Phone: 87 40 50 00

info@seges.dk

Copyright belongs to SEGES Innovation P/S. Information from this website may be used in other contexts provided the source is cited.

Disclaimer: The information on this page is of a general nature and is not intended to address individual or specific advisory needs.

SEGES Innovation P/S is therefore in no way liable for any losses, whether direct or indirect, that users may incur as a result of using the information provided.