

Jais, Christina; Oppermann, Peter and Schwanfelder, Josef

# Rubber mats in the lying area of pregnant sows – 2. claws, joints and motion

During a two year lasting study the floor in the lying area in a pen for 30-40 pregnant sows was fitted with rubber mats, while in an identically designed control pen, the lying area was equipped with slatted (with holes) concrete floor. The activity area of both pens consisted of slatted concrete floor. To evaluate the effect of rubber mats on the sows, claws and joints were judged regularly. Sows entered in the study with their second pregnancy and stayed, depending on their lifetime and their time of entering, up to five pregnancies in the study. Lateral abrasions of claw horn were significantly reduced by rubber mats in the sow's lying area. The other criteria, alterations of the ball, injuries of the skin above of the claws, fractures of the claw horn, comparison of the length of the inner and outer claw, length of dewclaw, alterations of the joints and motion were not influenced by the type of floor in the lying area.

## Keywords

Rubber mats, pigs, claws, joints, motion

## Abstract

Landtechnik 68(3), 2013, pp. 172–177, 10 tables, 3 references

■ In the stables of the Bavarian State Research Centre for Agriculture at the Centre for Pig Husbandry at Schwarzenau, during a two year lasting study the floor of a pen for 30-40 sows was equipped with rubber mats (**Figure 1**). In the same building an identically designed pen, of which the lying zones were fitted with slatted (round holes) concrete floor, served as control unit (**Figure 2**). Pen design with automatic individual feeding stalls, lying zones, activity areas and an open air area, the mats, material and method of the experiment and the results concerning claw length were already described [1; 2].

## Results

In the following the results of the rating of claws, joints and motion are reported. Therefore on the one hand the results of all pregnancies of all sows included in the experiment are compared, not regarding whether the sows completed one, two, three, four or five pregnancies during the study. Additionally data of those sows are regarded, that completed at least four experimental runs. In this case, judging is based on the marks attributed before entering into the study, what means before the first introduction of the sows in the waiting pen, as well as on

the marks attributed after moving the sows from waiting area after their fourth pregnancy and on the difference between these two ratings. These data allow the detection of possible long term effects.

The comparison is based on one single mark per sow. Therefore only the worse mark of the animal's two rated legs was considered.

The comparison of the marks was carried out using the chi-square-procedure on data sorted by the number of litters respectively the number of pregnancies completed during the study. Depending on the frequency of the different marks, mark 3 and 4 or mark 2, 3 and 4 were combined.

Data of live weight were tested using analysis of variance considering the factor of experimental treatment.

## Rating of claws

For the rating of each of the following characteristics - injuries of the claw horn, injuries of the skin, comparison of the length of inner and outer claw and length of dewclaws - 218 pregnancies on rubber mats and 205 pregnancies on concrete floor could be considered. 33 sows of the experimental pen and 27 sows of the control pen stayed for at least four experimental runs or pregnancies in the study.

For the rating of the balls 206 pregnancies in the experimental pen and 193 pregnancies in the control pen could be considered. 29 resp. 25 sows ran at least four pregnancies on rubber mats resp. on concrete floor.

Concerning the before mentioned characteristics no significant differences between the experimental treatments „lying area with rubber mats“ and „lying area with concrete floor“ could be found, that would indicate advantages of the rubber mats. This was true when regarding all pregnancies as well as when regarding only those sows with at least four pregnancies (Table 1, 2, 3, 4, 5 and 6).

Remarkable is the continuous deterioration of the rating during the course of a pregnancy. For each characteristic at the

time of moving the sows from the waiting pen mark 1, the best mark, was less frequently attributed and mark 3 and 4 most frequently (Tables 2, 3, 4, 5 and 6).

### Joints

Also regarding the status of the joints no significant differences between the experimental treatments appeared. The continuous deterioration of the rating during the course of a pregnancy, described for the above mentioned characteristics

Table 1

Rating of claws, joints and motion of sows with at least four pregnancies during the study

Merkmal Symptom	Zeitpunkt Time	Behandlung Treatment	Bewertung/Rating				Signifikanz Significance <sup>1)</sup>
			Note 1 Mark 1	Note 2 Mark 2	Note 3 Mark 3	Note 4 Mark 4	
Ballenveränderungen Alterations of the balls	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	21	8	0	0	n. s.
		Betonboden/Concrete floor	14	9	2	0	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	3	20	6	0	n. s.
		Betonboden/Concrete floor	2	20	3	0	
Wandhornrisse Injuries of claw horn	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	29	3	1	0	n. s.
		Betonboden/Concrete floor	22	5	0	0	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	16	13	4	0	n. s.
		Betonboden/Concrete floor	8	11	8	0	
Wandhorn- abschürfungen Lateral abrasions of claw horn	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	28	5	0	0	n. s.
		Betonboden/Concrete floor	21	6	0	0	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	21	10	2	0	p < 0,1 %
		Betonboden/Concrete floor	4	15	8	0	
Hautverletzungen (Kronsaum) Injuries of skinn	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	30	3	0	0	n. s.
		Betonboden/Concrete floor	26	1	0	0	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	10	19	4	0	n. s.
		Betonboden/Concrete floor	8	17	2	0	
Länge Innen- zu Außenklaue Length of inner and outer claw	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	29	4	0	0	n. s.
		Betonboden/Concrete floor	27	0	0	0	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	9	21	3	0	n. s.
		Betonboden/Concrete floor	11	14	2	0	
Länge Afterklauen Length of dewclaws	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	19	12	1	1	n. s.
		Betonboden/Concrete floor	16	7	2	2	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	1	7	20	5	p < 1 %
		Betonboden/Concrete floor	6	13	7	1	
Fessel- und Sprunggelenke Joints	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	21	12	0	0	n. s.
		Betonboden/Concrete floor	13	11	2	0	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	10	22	0	1	n. s.
		Betonboden/Concrete floor	5	17	4	0	
Gangweise Motion	Vor Versuchsstart Before start of the experiment	Gummimatten/Rubber mats	18	16	0	0	n. s.
		Betonboden/Concrete floor	12	12	1	0	
	Nach vier Trächtigkeiten After four pregnancies	Gummimatten/Rubber mats	4	11	18	1	n. s.
		Betonboden/Concrete floor	3	10	11	1	

<sup>1)</sup> p = Irrtumswahrscheinlichkeit/probability of error; n. s. = nicht signifikant/non significant (p > 5 %).

Table 2

Alterations of the ball at different times of rating  
(399 pregnancies)

Zeitpunkt/Time	Boniturnote/Mark			
	1	2	3	4
Vor dem Einstellen in den Wartebereich <i>Before introduction into the pregnancy pen</i>	230	153	14	2
10 Tage nach dem Einstellen in den Wartebereich <i>10 days after introduction into the pregnancy pen</i>	202	179	17	1
Nach dem Ausstellen aus dem Wartebereich <i>After taking out of the pregnancy pen</i>	136	224	34	5

Table 3

Fractures of the claw horn at different times of rating  
(423 pregnancies)

Zeitpunkt/Time	Boniturnote/Mark			
	1	2	3	4
Vor dem Einstellen in den Wartebereich <i>Before introduction into the pregnancy pen</i>	328	88	5	4
10 Tage nach dem Einstellen in den Wartebereich <i>10 days after introduction into the pregnancy pen</i>	297	112	14	0
Nach dem Ausstellen aus dem Wartebereich <i>After taking out of the pregnancy pen</i>	188	178	54	3

Table 4

Injuries of the skin above the claw at different times of rating  
(423 pregnancies)

Zeitpunkt/Time	Boniturnote/Mark			
	1	2	3	4
Vor dem Einstellen in den Wartebereich <i>Before introduction into the pregnancy pen</i>	272	151	0	0
10 Tage nach dem Einstellen in den Wartebereich <i>10 days after introduction into the pregnancy pen</i>	190	217	16	0
Nach dem Ausstellen aus dem Wartebereich <i>After taking out of the pregnancy pen</i>	154	259	10	0

Table 5

Comparison of the length of the inner and outer claw at different times of rating (423 pregnancies)

Zeitpunkt/Time	Boniturnote/Mark			
	1	2	3	4
Vor dem Einstellen in den Wartebereich <i>Before introduction into the pregnancy pen</i>	321	96	5	1
10 Tage nach dem Einstellen in den Wartebereich <i>10 days after introduction into the pregnancy pen</i>	312	105	5	1
Nach dem Ausstellen aus dem Wartebereich <i>After taking out of the pregnancy pen</i>	251	158	12	2

could not be seen here (Tables 1 and 7). For the rating of the joints 218 pregnancies on rubber mats and 205 pregnancies on concrete floor could be considered. 33 sows in the experimental pen and 26 sows in the control pen stayed for at least four experimental runs or pregnancies in the study.

Table 6

Length of dewclaws at different times of rating  
(423 pregnancies)

Zeitpunkt/Time	Boniturnote/Mark			
	1	2	3	4
Vor dem Einstellen in den Wartebereich <i>Before introduction into the pregnancy pen</i>	119	238	59	7
10 Tage nach dem Einstellen in den Wartebereich <i>10 days after introduction into the pregnancy pen</i>	97	245	72	9
Nach dem Ausstellen aus dem Wartebereich <i>After taking out of the pregnancy pen</i>	70	209	127	17

Table 7

Joints (ankle and fetlock) at different times of rating  
(423 pregnancies)

Zeitpunkt/Time	Boniturnote/Mark			
	1	2	3	4
Vor dem Einstellen in den Wartebereich <i>Before introduction into the pregnancy pen</i>	134	265	23	1
10 Tage nach dem Einstellen in den Wartebereich <i>10 days after introduction into the pregnancy pen</i>	146	263	41	2
Nach dem Ausstellen aus dem Wartebereich <i>After taking out of the pregnancy pen</i>	150	252	18	3

### Lateral abrasions of the claw horn

Lateral abrasions of the claw horn at the end of the pregnancy appeared significantly more frequently within sows kept only on concrete floor than within sows, whose lying area was equipped with rubber mats. This effect was clear when regarding all pregnancies (Table 8) as well as when comparing data from sows with at least four pregnancies (Table 1).

Whilst for these sows the rating before their entry in the study, what means before their first introduction in the experimental resp. control pen, was equal, the sows of the control pen showed a significantly worse rating at the time of moving them from the pens after four pregnancies. Also the change of the rating during the course of this period was significantly different ( $p < 1\%$ ). For the rating of the claw abrasions 218 pregnancies on rubber mats and 205 pregnancies on concrete floor could be considered. 33 sows of the experimental pen and 27 sows of the control pen stayed for at least four experimental runs or pregnancies in the study.

### Motion

For the rating of the motion 199 pregnancies on rubber mats and 185 pregnancies on concrete floor could be considered. 34 sows of the experimental pen and 24 sows of the control pen stayed for at least four experimental runs or pregnancies in the study.

No significant differences could be detected (Table 1 and 9). Remarkable is the clearly worse rating at the time 10 days after introduction into the waiting pen.

Table 8

Lateral abrasions of the claw horn at different times of rating (423 pregnancies)

Zeitpunkt/Time	Behandlung/Treatment	Boniturnote/Mark				Bemerkung/Note
		1	2	3	4	
Vor dem Einstellen in den Wartebereich Before introduction into the pregnancy pen	Gummimatten/Rubbermats	183	35	0	0	
	Betonboden/Concrete floor	161	42	2	0	
10 Tage nach dem Einstellen in den Wartebereich 10 days after introduction into the pregnancy pen	Gummimatten/Rubbermats	159	59	0	0	
	Betonboden/Concrete floor	130	72	3	0	
Nach dem Ausstellen aus dem Wartebereich After taking out of the pregnancy pen	Gummimatten/Rubber mats	158	52	8	0	
	Betonboden/Concrete floor	101	83	20	1	

Table 9

Motion at different times of rating (384 pregnancies)

Zeitpunkt/Time	Boniturnote/Mark			
	1	2	3	4
Vor dem Einstellen in den Wartebereich Before introduction into the pregnancy pen	99	204	75	6
10 Tage nach dem Einstellen in den Wartebereich 10 days after introduction into the pregnancy pen	30	188	139	27
Nach dem Ausstellen aus dem Wartebereich After taking out of the pregnancy pen	70	193	109	12

### Live weight

Regarding the sow's weight, the animals of the experimental pen showed a significantly higher gain during the course of four pregnancies, though weight at the start of the study was equal (Table 10).

### Discussion

#### Effect of floor type in the lying area

The lateral abrasions of the claw horn within sows whose lying area was equipped with rubber mats was significantly less than within sows which lay on concrete slatted floor. The cause therefore may be the "padding" of the feet, a phenomenon that can be seen within lying sows. The animals move their feet for-

ward and backward, rubbing the claws, more exactly the lateral horn on the ground. Here, rubber mats, less rough, obviously cause less abrasions than the concrete floor. This observation is in accordance with the results of Baumann et al.[3]. However, on concrete floor, severe abrasions could be seen only once.

The harder and rougher surface of the concrete floor seemed to have no effect on the alterations of the ankle and the fetlock. Also the characteristics alteration of the balls, injuries of the claw horn, alterations of the skin above the claw, comparison of the length of inner and outer claw and length of dewclaws were not influenced by the type of floor in the lying area.

Length of dewclaw was judged worse of all characteristics. 23% of all ratings were mark 3 or 4 (Table 6). That underlines the risk, which exists for the intact dewclaw in group pens and emphasizes the need of its shortening carried out regularly.

The rating of the length of inner and outer claws showing no difference between experimental and control group is in accordance with the results of the claw length [2], where rubbers had no effect too.

Motion of the sows, judged from "without pathological findings" to "severely obstructed" finally was not affected by the type of floor in the lying area. The differences seen for the lateral abrasion of the claw horn seemed to have no impact on the sow's way of moving. Maybe because severe abrasions and clearly visible damages of the tissues beneath the horn were not noticed resp. were noticed only once.

Table 10

Development of sow's weight from their introduction into the study up to the end of their fourth pregnancy during the study

Lebendmasse, kg Weight, kg	Behandlung/Treatment		Signifikanz/Significance <sup>1)</sup>
	Gummimatten/Rubber mats	Betonboden/Concrete floor	
	29 Sauen	24 Sauen	
Vor Versuchsstart Before start of the experiment	284,4 ± 28,9	282,5 ± 30,9	n. s.
Nach vier Trächtigkeiten After four pregnancies	320,1 ± 26,8	310,8 ± 30,2	n. s.
Veränderung/Difference	35,6 ± 10,2	28,2 ± 13,0	P < 5%

<sup>1)</sup> p = Irrtumswahrscheinlichkeit/probability of error; n. s. = nicht signifikant/non significant (p > 5%).

The experimental capacity with only five experimental runs was not enough to judge any effect on the sow's life time. But the lack of effect of the rubber mats on almost each of the characteristics, included motion, lowers any expectation in this context.

### Comparison of the times of rating

For the characteristics alterations of the balls, injuries of the claw horn, lateral abrasions of the claw horn, injuries of the skin above the claws, comparison of length of inner and outer claw and length of dewclaws, rating got worse during the course of a pregnancy. This is in accordance with the findings of Baumann et al. [3] in respect of the alterations of sole and balls and of lateral abrasions of the claw horn. Regarding the results separately depending on the sow's number of litters, the rating got better from the time "after moving from the waiting pen" of the foregoing pregnancy to the time "before introduction to waiting pen" of the following pregnancy. This may be caused by regeneration of the horn what means by newly built horn material [3]. Additionally during the period between two pregnancies some sows were brought to slaughter, whose claws might have been worse than those of the average of sows. But maybe the clear improvement of the ratings was also a result of the different conditions at the different times of rating. Infact the conditions differed significantly, which may have an influence on the exactness of the results.

The rating after moving the sows from the waiting pen took place in the farrowing pen where sows were kept singly in farrowing crates. The hind legs of the mostly lying animals could be easily touched and seen. The rating conditions at that time were optimal and the results are highly confidential. The rating 10 days after introduction in the waiting pen were already more difficult. The animals and their legs could not as easily be seen as because of the group housing and the resting position side by side. Most difficult was the rating at the time before introduction to the waiting pen, which took place in the individual crates of the gestating area. The rating of two last mentioned times may underestimate the true frequency of alterations and therefore at least partly overestimate the deterioration of the claw status in the course of a pregnancy.

In contrast, the rating of motion could be carried out under equal conditions at each time.

### Conclusions

Rubber mats in the lying area of sows in combination with concrete floor in the activity area showed no positive effect on claws, joints and motion, with the exception of the lateral abrasions of the claw horn. Therefore, rubber mats should be tested also in the activity area.

### References

- [1] Jais, C.; Oppermann, P. (2012): Einsatz von Gummimatten bei tragenden Sauen - Haltbarkeit und Sauberhaltung. *Landtechnik* 67(4), S. 291-294
- [2] Jais, C.; Oppermann, P., Schwanfelder, J.; Ebert, J. (2013): Einsatz von Gummimatten im Liegebereich tragender Sauen - Teil 1. Auswirkungen auf die Klauenlänge. *Landtechnik* 68(2), S. 117-121
- [3] Baumann, S.; Pflanz, W., Gallmann, E.; Schrader, L. (2012): Beurteilung der Klauengesundheit von Sauen in unterschiedlichen Haltungsverfahren. *Landtechnik* 67(6), S. 413-416

### Authors

**Peter Oppermann** und **Dr. Christina Jais** work in the team "Pig Husbandry" at the Institute for Agricultural Engineering and Animal Husbandry of the Bavarian State Research Centre for Agriculture in Grub, Josef Schwanfelder at the Centre for Pig Husbandry at Schwarzenau. Prof.-Dürrewächter-Platz 2, D-85586 Poing/Grub; e-mail: christina.jais@LfL.bayern.de