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# Assessing sow foot health in various types of housing

During the production cycle sows experience different housing systems and floorings: in the service centre, in the dry sow accommodation and in the farrowing house. To investigate the effects on their feet of the different systems, sows were regularly inspected and scored over a period at the State Institute for Pig Breeding and Management (LSZ), Boxberg Education and Knowledge Centre. The results from over 1 300 individual inspections show that, under loose housing management in groups, the sole and ball areas of sow feet are subject to increased wear and damage. Horn wall injuries are identified mainly with sows on slatted flooring in the lying area. On the other hand, where sows are confined individually in farrowing pens their feet can show a lack of even wear.

**Key words**
Foot health, lameness, group management, sows

**Abstract**
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Foot and leg problems are major reasons for sows being culled from the breeding herd [1]. In a study by the "Feet First" group more than 96 % of all lame sows and 80 % of all culled sows had foot injuries [2].The housing, but also hygiene, barn climate, management, feed and the genetics involved all have influence on foot health [3]. Damage to the balls and soles of the feet, splits and cracks in the horn as well as skin damage through pressure points or crushing are often to be found in strawless management systems [4]. Against this, flooring offering a variety of tendencially softer surfaces is physiologically better for pigs' feet [5]. Trial results show there is a significant relationship between flooring material, length of digits, cracks in the horn and performance parameters of the animals concerned [6]. Changing over to loose housing of groups can easily lead to sow ranking fights or other aggressive activities and these in turn to foot injuries caused by rapid (flight) movements of the legs [3]. On the other hand, management systems where movement is curtailed can result in a lack of wear of the growing horn. The horn growth in sows' feet is around five to six millimetres per month [3].

## Animals, material and methods

The assessment of sow foot health is a part of the BMELV (German Federal Ministry of Food, Agriculture and Consumer Protection) supported project "Pig Comfort – Development of Comfort Matting for Lying and Movement Areas in Sow Housing". The investigation was conducted in the piglet production section of the Education and Knowledge Centre for Pig Breeding and Pig Management in Boxberg, Baden-Württemberg (LSZ). The assessment of feet condition took place in all three production sectors (service centre, dry sow housing and farrowing accommodation) with sows observed in each case from the beginning to the end of the particular stage.

The service centre featured two pens, each for 15 loose housed sows. One had a conventional slatted floor. The other had rubber matting (Kraiburg) on the lying area. The loose housed sows were kept for five weeks in the service centre.

In the farrowing house sows were individually confined in farrowing crates for five weeks. Eight farrowing pens were in each compartment. Flooring under the farrowing crate was cast metal grating and the rest of the pen flooring was of plastic-coated expanded metal.

Dry sow housing featured dynamic groups. The compartment comprised lying bays with rubber matting on the floors, plus an exercise area and an outrun with slatted flooring. It contained two electronic feeders. The sows were housed for 11 weeks in this section.

The entire piglet production sector had capacity for 168 sows. Some of the sows were examined and scored several times in each of the different housing areas. A total 1 367 separate recordings were made. The number of separate recordings for scoring the condition of feet totalled 286 in the service centre, 360 in the dry sow housing and 721 in the farrowing accommodation. All sows were BW hybrids (from the Baden-Württemberg hybrid breeding programme). Commercial standards of feeding and management were followed.

For assessing the condition of sows' feet the "aid Infodienst" (Food, Agriculture, Consumer Protection Information Service) scoring system was used [3]. This applies a one to four point

scoring system (no noticeable impairments through to serious injuries) and takes into account the following characteristics: length of foot digits, relationship of the inner and outer digits of the foot, length of anus claws and any injuries thereof, coronary band injuries, abrasions to the horn wall, horn cracks, sole defects and white line lesions. Additionally, wounds, the synovial bursae and the gait of the sow were all taken into consideration. The "Locomotion Scoring System" of the working group Feet First [7] was applied for assessment of gait. With all sows only the rear feet were assessed and number of parturitions in each case was used as an aid to estimate sow age. The statistical data evaluation applied generalised linear models with the software program SAS (Glimmix).

## Results

### Service centre

The rubber mats in the lying area showed themselves to have a positive influence on sow feet health compared with slatted flooring. In **Table 1** the characteristic "Foot with horn wall abrasions and dermis bleeding" is given as example. On rubber matting there were hardly any alterations in this characteristic visible from beginning to end of the recording period. On the other hand, sows kept on slatted flooring all showed increased incidence of abrasions on the horn wall during the period. On the slatted flooring assessment of foot condition showed marked worsening while the foot inspection results of sows on rubber matted flooring remained almost the same from begin-

Table 1

*Comparison of sow feet on slatted floors and rubber mats. Frequency of characteristics in percent. Differences in percent points. Note 1 = no distinctive feature, note 4 = massive lesion*

| **286 Datensätze/*Records*** | | | | | |
|---|---|---|---|---|---|
| **Häufigkeit des Merkmals Wandhornabschürfung/Lederhautblutung in Prozent** ***Frequency of characteristics wall abrasion/bleeding dermis in percent*** | | | | | |
| **Boniturnote/*Ranking*** | | **1** | **2** | **3** | **4** |
| Spaltenboden/*Slatted floor* n = 70 Sauen/*sows* | Einstallen/*begin* | 8,5 | 67,9 | 23,6 | 0 |
| | Ausstallen/*end* | 0 | 22,9 | 70,7 | 6,4 |
| | **Differenz/*difference*** | **-8,5** | **-45,0** | **+47,1** | **+6,4** |
| Gummimatten/*Rubber mats* n = 73 Sauen/*sows* | Einstallen/*begin* | 20,7 | 62,7 | 15,2 | 1,4 |
| | Ausstallen/*end* | 12,4 | 62,3 | 24,6 | 0,7 |
| | **Differenz/*difference*** | **-8,3** | **-0,4** | **+9,4** | **-0,7** |

*The comparison of the flooring materials according to foot condition scoring took place with the aid of a generalised linear model on the basis of a multinominal distribution (proc glimmix, sas ver. 9.3). Data up to time of entry into the respective housing were randomised. The p value was reached through comparison of the flooring materials based on foot condition scoring through to the point of leaving the building flooring p<0.0001.*

Table 2

*Changes of sow feet health in group housing. Frequency of characteristics in percent. Differences in percent points. Note 1 = no distinctive feature, note 4 = massive lesion*

| **360 Datensätze/*Records*** | | | | | | |
|---|---|---|---|---|---|---|
| **Häufigkeit des Merkmals in Prozent/*Frequency of characteristics in percent*** | | | | | | |
| **Boniturnote/Ranking** | | **1** | **2** | **3** | **4** | **p-Wert/*p-value*** |
| Sohlendefekte, Ballenhorndefekte und -wucherungen *Sole lesions, ball horn lesions and abnormal growth* | Einstallen/begin | 36,9 | 45,3 | 17,5 | 0,3 | 0,0001 |
| | Ausstallen/end | 11,9 | 40,2 | 41,0 | 6,9 | |
| | **Differenz/*difference*** | **-25,0** | **-5,1** | **+23,5** | **+6,6** | |
| Zusammenhangs-trennungen Sohle/Ballen, Weiße-Linie-Defekt *Separations sole/balls, lesions in white line region* | Einstallen/begin | 45,4 | 46,5 | 8,1 | 0 | 0,0001 |
| | Ausstallen/end | 26,6 | 41,5 | 26,6 | 5,3 | |
| | **Differenz/*difference*** | **-18,8** | **-5,0** | **+18,5** | **+5,3** | |

*The comparison between the start and end of a housing phase with regard to foot condition scoring took place with the aid of a generalised linear model on the basis of multinominal distribution (proc glimmix, sas ver. 9.3).*

Fig. 1

*Score 1 - Sole lesions, ball horn lesions and separations sole (white line) (Photo: Baumann)*

Fig. 2

*Score 4 - Sole lesions, ball horn lesions and separations sole (white line) (Photo: Baumann)*

ning to end. Comparing the flooring based on these characteristics through the inspection and scoring system throughout the period produces highly significant differences ($p < 0.0001$).

**Gestating sow housing**

The loose housing of groups of gestating sows on slatted flooring increased the number of injuries on feet soles and balls. **Table 2** demonstrates the procentual frequency of the characteristics "sole defects, ball horn defects and growths" and "associated separation of feet soles/balls, white line lesions". With both characteristics the scoring notes one (**Figure 1**) and two were downgraded to three and four (**Figure 2**). Thus, following their gestation sows showed a worsening of both these characteristics. The differences in these cases are highly significant.

**Farrowing housing**

During individual sow confinement (farrowing crates) in the farrowing building the wear on sow feet proved to be insufficient, leading to underdevelopment of the inner digit as demonstrated by the results in **Table 3**. With regard to the characteristic "horn wall abrasions, dermis bleeding" individual confinement on a cast iron grating could be seen to have a positive effect. There was regrowth of horn wall so that scoring of three and four was improved to one and two for this characteristic. Another positive effect concerned "horn wall separation/white line defect" with foot soles and balls. Up to leaving the farrowing housing 61.6 % of the examined feet were scored "one" for this characteristic. All the results could be statistically verified.

Table 3

*Changes of sow feet health in farrowing stables. Frequency of characteristics in percent. Differences in percent points. Note 1 = no distinctive feature, note 4 = massive lesion*

| **721 Datensätze/*Records*** | | | | | | |
|---|---|---|---|---|---|---|
| **Häufigkeit des Merkmals in Prozent/*Frequency of characteristics in percent*** | | | | | | |
| **Boniturnote/*Ranking*** | | **1** | **2** | **3** | **4** | **p-Wert *p-value*** |
| Verhältnis Klauen *Claw relation* | Einstallen/begin | 35,5 | 49,3 | 11,0 | 4,2 | 0,006 |
| | Ausstallen/end | 24,3 | 58,9 | 11,1 | 5,7 | |
| | **Differenz/*difference*** | **-11,2** | **+9,6** | **+0,1** | **+1,5** | |
| Überlange Klauen *Claw length* | Einstallen/begin | 82,4 | 14,5 | 2,5 | 0,6 | 0,0001 |
| | Ausstallen/end | 68,9 | 23,9 | 6,5 | 0,7 | |
| | **Differenz/*difference*** | **-13,5** | **+9,4** | **+4,0** | **+0,1** | |
| Wandhornabschürfungen, Lederhautblutungen *Wall abrasion, bleeding dermis* | Einstallen/begin | 8,3 | 55,9 | 35,2 | 0,6 | 0,0001 |
| | Ausstallen/end | 28,1 | 67,6 | 4,3 | 0 | |
| | **Differenz/*difference*** | **+19,8** | **+11,7** | **-30,9** | **-0,6** | |
| Zusammenhangstrennungen Sohle/Ballen, Weiße-Linie-Defekt *Separations sole/balls, lesions in white line region* | Einstallen/begin | 33,3 | 35,9 | 25,2 | 5,6 | 0,0001 |
| | Ausstallen/end | 61,6 | 30,3 | 7,0 | 1,1 | |
| | **Differenz/*difference*** | **+28,3** | **-5,6** | **-18,2** | **-4,5** | |

*The comparison between the start and end of a housing phase with regard to foot condition scoring took place with the aid of a generalised linear model on the basis of multinominal distribution (proc glimmix, sas ver. 9.3).*

## Conclusions

The feet and legs of a sow are differently affected by the various housing conditions during the production cycle. Clearly, sows' feet developed differently under the various flooring conditions of individually confined and group housed sows. In the farrowing housing suckling sows are confined in farrowing crates which restricts movement. As a result sow feet are used less and indicate signs of insufficient wear. At the same time horn wall tissue is able to regenerate. During gestation dry sows are housed mainly on slatted floors with the main injuries noted on the balls and soles. Rubber matting can lead to an improvement in feet health. It was shown that sows housed continually on slatted flooring showed increased incidence of abrasions on horn walls. Rubber mats in the laying area reduced the abrasion damage to the horn walls.

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## Further information

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