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Effect of rubber slat mats on the behaviour and welfare of group housed pregnant sows

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ABSTRACT

This study evaluated the effect of flooring, lameness, body and limb lesion scores on postural and spatial behaviour of gestating sows. Sixty-four sows were kept in groups of four in pens with four solid concrete floored feeding stalls and a concrete fully slatted group area from 4 weeks after service. The slats were either left uncovered (CON; $n = 8$ groups) or 10 mm thick rubber slat mats were affixed (RUB; $n = 8$ groups). Lameness (0 = normal to 5 = severe), limb (environmentally induced lesions, e.g. callus, wounds, swellings; scored according to severity—0 = normal to 6 = severe) and body (aggression induced lesions; scored according to severity—0 = normal to 5 = severe) lesions were scored on days 1, 8, 25, 50 and 75 relative to entering the experiment. Additionally video recordings were made of the groups for 24 h on the same days which were sampled instantaneously every 10 min. An index of the proportion of time spent in (1) different postures (standing, ventral [VL] and lateral lying [LL] and total lying [VL + LL]); (2) locations (stalls or group area), (3) posture by location and (4) number of postural changes was calculated. Sows were categorized as non-lame (score $\leq$1) or lame (score $\geq$2). Median scores were calculated for body and limb lesions and were classified as $\leq$median or >median. Lameness, limb and body lesions were analysed using logistic binomial regression. Behavioural variables were tested for normality and analysed using mixed model equations. Flooring did not affect lameness, body lesion scores, time spent in each posture or the index of postural changes ($P > 0.05$). RUB sows spent more time in the group area (76.3 vs. 53.3 ± 5.8%; $P < 0.01$) and lay more there (80.0 vs. 62.4 ± 5.3%; $P < 0.05$) compared with CON sows. Sows with scores >median for wounds on the limbs spent more time LL (41.2 vs. 48.3 ± 3.6%; $P < 0.05$) and less time VL (36.3 vs. 29.9 ± 2.9%; $P < 0.05$). On the other hand, sows with body lesion scores >median spent more time VL (29.9 vs. 36.3 ± 2.9%; $P < 0.05$). Lame sows stood less and lay more ($P < 0.05$) in the feeding stalls. When sows had access to rubber flooring they spent more time in the covered area and lay more there compared with sows in pens where the concrete slats were bare. This reflects the preference of group housed sows for a comfortable surface for lying during pregnancy. Other sow factors such as body and limb lesions and lameness status are also related with lying behaviour.

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1. Introduction

Comfort while lying is of vital importance for sow welfare as pregnant sows spend about 80% of their time lying (Ekkel et al., 2003). Hence, given that the majority of pregnant sows worldwide are kept on concrete floors it is

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likely that their comfort needs are not being met (Elmore et al., 2010). Floor type affects the incidence of lameness (Heinonen et al., 2006; Zurbrigg and Blackwell, 2006) and limb lesions (Mouttotou et al., 1998; KilBride et al., 2008; von Wachenfelt et al., 2008). Straw bedding improves the physical and thermal comfort of the floor (Barnett et al., 2001; Tuyttens, 2005); however, in modern pig production systems, the use of straw is unfeasible because of liquid manure disposal systems and the associated increase in production costs and labour. Rubber slat mats could be an alternative to bedding for pigs. They are more yielding and have a lower thermal conductivity than bare concrete (Bøe et al., 2007) making them warmer to lie on. It also appears that they are less injurious than concrete as group housed pregnant gilts kept on rubber slat mats were less likely to be lame and had a reduced risk of severe swellings and wounds on the limbs compared with gilts on concrete slats (Calderón Díaz et al., 2013). Research on the influence of rubber flooring on sow behaviour is limited to two short term studies. Both Tuyttens et al. (2008) and Elmore et al. (2010) reported that when rubber mats were added to a group housing system, sows preferred to rest on areas covered with rubber mats compared to uncovered/concrete areas. Furthermore, sows spent more time lying laterally in areas covered with rubber mats vs. areas of bare concrete. In accordance with the findings of Boyle et al. (2000) for sows on rubber in farrowing crates, sows in groups on rubber slat mats also showed greater ease of changing posture (Tuyttens et al., 2008; Elmore et al., 2010). The effect of rubber flooring on sow lying and spatial behaviour during her entire pregnancy is not known. Additionally, little is known about the potential influence which welfare issues such as lameness and limb lesions may have on the postural and spatial behaviour of group housed sows. Therefore the objectives of this study were (1) to compare lameness, limb and body lesion scores of sows housed on concrete slatted floor or rubber slat mats, and (2) to evaluate the effect of flooring type, lameness, body and limb lesion scores on postural and spatial behaviour of gestating sows.

2. Materials and methods

2.1. Ethical statement

This trial was conducted in accordance with the International Guiding Principles for Biomedical Research Involving Animals as issued by the Council for the International Organizations of Medical Sciences in 1985 and the ethical guidelines from the International Society for Applied Ethology. However, as at the time that the study was conducted Teagasc did not have an ethical committee, the protocol did not undergo a formal ethical review. The research farm on which this experimental work was conducted was in compliance with Statutory Instrument S.I. No. 311 of 2010 European Communities (Welfare of Farmed Animals) Regulations 2000. Furthermore, as no invasive measures were used, the experiment did not require licensing under Directive 2010/63/EU and S.I. No. 543 of 2012 European Communities (Amendment of Cruelty to Animals Act, 1876) Regulations 2005.

2.2. Experimental design and husbandry

The study was conducted on the experimental farm of the Pig Development Department, Teagasc Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland from March 2011 to June 2012. A total of 64 Large White × Landrace sows housed in groups of four were included in the study.

Thirty-two first parity sows (or 'gilts') were artificially inseminated between 32 and 36 weeks of age by trained farm staff during their second heat. They were housed together in a single 'all gilt' group with an electronic sow feeder and remained in this accommodation until assignment to the experiment at 28 days post-service. Thirty-two multiparous sows were inseminated in individual stalls when heat was detected after weaning. Sixteen of these were housed in a single dynamic group with an electronic sow feeder and the remaining 16 sows were housed in individual gestation stalls during their previous pregnancies. All sows were served for a second time 24 h after the first service and then they were moved to gestation stalls for 28 days. A boar was present in the breeding barn for heat detection at all times.

Four sows were grouped together according to parity (eight groups of gilts, and eight groups of sows parity ≥4; there were no 2nd or 3rd parity sows in the herd at the time of the experiment) and assigned to the experiment at 28 days post-service such that there were eight experimental groups per treatment. Within each parity group, sows were balanced according to their lameness score on the day the trial started. Thus, in each group there were non-lame and lame sows. Additionally, for the multiparous sows, sows were balanced between flooring treatments according to their previous housing system. Ultimately, thirty-two sows were housed in pens with concrete flooring (parity average 3.4 ± 2.64; BW average 213.7 ± 44.09) and 32 sows were housed in pens with rubber slat mats in the group area (parity average 3.3 ± 2.52; BW average 199.7 ± 36.13).

The test pens used in this study had four free access feeding stalls (each 1.71 m L × 0.65 m W × 1.02 m H) with solid concrete flooring. Behind the feeding stalls there was a group area (3.20 m L × 2.68 m W) for exercise and dunging with concrete slatted (slat width 14.5 cm, gap width 2 cm; void area = 8.2%) flooring which was either uncovered (CON) or covered with rubber slat mats (RUB) (EasyFix™ Rubber Products, Ballinasloe, Co. Galway, Ireland). Four test pens (2 × CON and 2 × RUB) were re-used four times during the 16 month trial. Sows remained in the test pens until day 110 of pregnancy. They were never confined in the feeding stalls and were free to move about the pen at all times. The RUB pens were identical to the CON pens except that the group area was covered with rubber slat mats (1.60 m L × 0.29 m W × 0.01 m H; void area = 8.2%). The rubber mats consisted of a 10 mm thick two-strip system with circular-shaped patterns on the surface and wedges underneath. Each strip of rubber matting covered two slats and one gap. The rubber slat mats were attached to the concrete slats by hammering the wedges underneath into the underlying gaps (Fig. 1). No additional means of fixation was required. The house was ventilated by a cross-ventilation system, whereby fresh air entered the building through an opening

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