

Improvements in the Welfare and Behaviour of Intensively Raised Pigs (*Sus scrofa domesticus*)

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Introduction

Welfare issues surrounding intensively raised pigs have gained attention in the public consciousness in recent years (Averós *et al.*, 2010). This, combined with the economic importance of the industry, has encouraged continuing research into the welfare standards of the domestic pig (Jordan *et al.*, 2008). Aspects of welfare and behavioural improvement in intensively raised pigs reported on over the past 15 months include: flooring type, environmental enrichment, diet and feeding level.

Discussion

In a study published in 2011, van Grevenhof *et al.* investigated the prevalence of osteochondrosis (OC) in growing pigs (n=345), and to what extent this is influenced by housing systems and feeding levels. The two housing systems studied were conventional pens (concrete floors with wooden slats) and deep-litter systems. The feeding level was either *ad libitum* or a restricted diet fed twice daily, which was calculated at 80% of the consumption of *ad libitum* fed pigs the previous week. Pigs were assigned one of four treatment groups, and subdivided into smaller groups, based on sex. At the start of the study, five joints were identified as being of interest: elbow, metacarpophalangeal, femoropatellar, tarsocrural, and metatarsophalangeal – with the authors later downplaying the significance of both the metacarpophalangeal and metatarsophalangeal joints.

After the animals were slaughtered (at between 161-176 days), the articular cartilages of the left limbs were all examined and scored by a veterinarian. Osteochondrosis was observed in 41.4% of all pigs, with severe signs observed in 12.4% of animals. The treatment group with conventional housing and *ad libitum* feeding had the highest incidence of OC (57.5%), while the deep-litter housed, restrictively fed group had the lowest frequency (33.7%). Despite focussing on grower pigs, the welfare implications of this study could potentially benefit breeding sows and boars, due to their greater size and weight. Physiological parameters (e.g., salivary cortisol concentrations) were not measured in this study, so it is unclear if the pigs that developed OC demonstrated a corresponding stress response.

Another study into the issue of flooring (Elmore *et al.*, 2010) compared conventional pens with those modified with rubber matting in the feeding area. The aim was to see if there was a positive impact on the behaviour and welfare of group-housed sows in pens with the modified flooring. All sows (n=128) were fed once daily and had *ad libitum* access to water. They were all breeding animals, and were artificially inseminated when they showed signs of oestrus. Video footage was taken and later analysed for behavioural analysis. The sows were also assessed before and after the experiment to ascertain the presence and severity of any lesions.

Sows held in the modified environment spent more time in the feeding area than those housed in conventional pens. This appears to be due to the superior comfort of rubber mats provided in this area. Lesion scores at the conclusion of the experiment were lower in sows housed in the modified pens. The authors hypothesise that the reasons for this are twofold; first, the rubber mats provide some level of cushioning against the hard concrete, and second, that these animals were able to stand up and adjust their position due to the decreased slipperiness of the floor. Although the sows appeared to prefer lying on the rubber flooring, they spent less time on it when the ambient temperature exceeded their thermoneutral zone. Therefore, the welfare and behavioural benefits of including rubber flooring in pens are greatest when ambient temperatures are not excessive.

Both of the above studies show that an improved housing system can increase welfare standards of intensively raised pigs. These studies involved looking mainly at behaviour and anatomical (post-mortem examination) considerations. However, physiological measurements are another way of examining the wellbeing of animals. Glucocorticoid measurements can be an indicator of how an animal responds to certain stressors. In pigs, the primary glucocorticoid secreted is cortisol, which is measured easily by sampling the saliva. This gives a good indication of the biologically active concentration in plasma. This method was used by Munsterhjelm *et al.* (2010) to assess whether environmental enrichment in early life modified the future secretion of cortisol in response to chronic stressors.

The hypothesis was that chronic stress when young, such as being housed in a barren environment, affected the hypothalamic-pituitary-adrenal axis, resulting in hyper-secretion of cortisol later in life. The experiment involved comparing the salivary cortisol concentrations of conventionally housed pigs with animals provided with straw daily. These results were then compared to an expected basal concentration, corresponding with a normal circadian rhythm. As this is a new technique for assessing stress in pigs, definitive results were not forthcoming. The researchers had different interpretations of what the normal porcine circadian rhythm should be, so identifying empirical differences from these values proved elusive. Despite this, there was an indication that the results may corroborate behavioural observations made during the study.

Environmental enrichment in this case was achieved through providing straw rooting material to pigs (n=252). Straw has been shown to have a positive effect on pig behaviour (Jordan *et al.*, 2008), which is demonstrated by decreased aggression toward pen-mates and an increase in activity levels. Jensen *et al.* (2010) examined the effect of the type of rooting material (straw or maize silage) on exploratory and abnormal behaviour. Pigs provided with maize silage spent more time rooting and showed less aggression than those given straw. The authors speculate that the preference for maize silage was in part due to the heterogeneity of the material, as well as the nutritional value of the grain in the silage, which could positively reinforce such rooting behaviour.

Conclusion

The studies identified in this paper highlight simple husbandry measures that can be employed to improve the lives of intensively raised domestic pigs. Although research in this field is ongoing, it is crucial that the health and welfare standards for domestic pigs are continually evaluated and improved wherever possible.

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