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Environmental enrichment and nutritional strategies to reduce tail biting in pig farms



Key external stakeholders:

Pig farmers, pig Industry, policymakers, meat processors, animal welfare groups, consumers

Practical implications for stakeholders:

Provision of organic environmental enrichment materials is possible in fully slatted systems, but its effectiveness, and attraction to the pigs, is dependent upon its intrinsic qualities and presentation

- We identified that pig farmers in Ireland are highly aware of the problem of tail biting, as it occurs relatively often
- The experiment has provided increased knowledge about the type of material which is attractive for pigs as a form of environmental enrichment in fully slatted systems

Main results:

Key results are

- Pig farmers recognise that tail biting is a significant problem on Irish pig farms, and there is a willingness to use wood, as it is a natural material and relatively long lasting
- Softer wood types appear to be more attractive to pigs than hard wood
- Straw blocks, were less attractive to pigs than plastic toys, labour intensive, and cost prohibitive
- Rearing of pigs without docking their tails creates a higher risk for tail biting, and the treatments investigated, which were effective for docked pigs, were unsuccessful

Opportunity / Benefit:

The data generated can be immediately used by producers as it provides objective information regarding the attractiveness of enrichment materials to pigs, their rate of wear, and the associated costs. Provision of environmental enrichment is a legal requirement, so the information will help producers to comply with current legislation.

Collaborating Institutions:

SRUC, University of Edinburgh

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1. Project background:

Pigs are omnivorous animals that under natural conditions spend a high proportion of their time performing exploratory and rooting behaviour in their search for food, and a more general motivation to obtain information about their environment. Despite domestication, commercially produced pigs continue to express exploratory behaviour (rooting, sniffing, chewing) even when satisfied nutritionally (Beattie and O'Connell, 2002). In barren environments this behaviour is directed towards other pigs, and can result in tail and ear biting. EFSA (2007) published a scientific opinion on the subject, and concluded that 'the occurrence of tail biting has a multi-factorial origin and there is evidence in the report that some causal factors have more weight, such as the absence of straw, the presence of slatted floors and a barren environment.' A lack of appropriate enrichment is considered the largest risk, compounded by a fully slatted floor (EFSA, 2007).

The majority of Irish pigs are reared on slatted floors, and it is thus imperative that appropriate enrichment is provided. Successful enrichment should fulfil four criteria: 1) increase species-specific behaviour, 2) maintain or improve levels of health, 3) improve the economics of the production system, and 4) be practical to employ (Van de Weerd and Day, 2009). The key characteristics of enrichment that sustain occupation for growing pigs are: ingestible, odorous, chewable, deformable, and destructible (Van de Weerd et al., 2003). It is widely reported that straw bedding is associated with reduced risk and prevalence of tail biting (EFSA, 2007). However, provision of straw in slatted pens is difficult, due to the risk of damaging the slurry system. Thus wooden posts, or 'chew-bars', which are used successfully in European countries where pigs are reared in slatted pens (Speijers, 2014), could pose a suitable alternative to straw.

2. Questions addressed by the project:

1. What is the level of awareness of, and attitude towards, tail biting and environmental enrichment amongst Irish producers?
2. Are compressed straw blocks favourable to pigs, and feasible for use in an Irish commercial pig unit?
3. Do different species of wood vary in characteristics which make them more or less attractive to pigs?
4. Can we rear undocked pigs using the most attractive options, and an increased fibre level?

3. The experimental studies:

Study 1: A survey of Irish pig producers was carried out Between August and November 2015. The survey had 26 questions split into 4 categories: General management, Feeding, Tail biting and Enrichment.

Study 2: A controlled experiment was carried out on a commercial pig unit from weaning until slaughter. The experiment was a 2 x 2 factorial design; pens were provided with either compressed straw blocks or hanging plastic toys at a ratio of 1:25 pigs, and contained either male or female pigs. The primary measures of interest were animal behaviour (damaging behaviour and interaction with the enrichment), level of tail and ear damage, and salivary cortisol levels. Additionally, behavioural tests were carried out (novel object and open field tests) to assess the emotional state of the pigs. Finally, the rate of use of the straw was recorded.

Study 3: Experiment on a commercial pig unit during the finisher stage, which compared 4 different wood types ranging in hardness: Spruce, Scots pine, Larch and Beech. Measures for analysis included animal behaviour (as above), tail and ear damage, tear scoring, and wear of the wood

Study 4: Experiment in Moorepark during the finisher stage. Comparison of Spruce, Larch, Beech and a rubber floor toy, with holders that allowed the wood to touch the floor.

Study 5: Experiment in the Moorepark pig unit, using pigs which did not have their tails docked. This study had a 2x2x2 factorial design: either a rubber floor toy or a soft wood plank in the weaner stage, then treatments were re-randomised across the finisher stage, and either a control or high fibre diet. Animal behaviour and lesion scoring were carried out, as were novel object tests. Three control strategies (remove the biter, remove the bitten pig, or add extra enrichment) were also compared for effectiveness at stopping biting when tail biting outbreaks occurred.

4. Main results:

Study 1: Fifty eight farmers contributed to the survey (out of approx. 300 in the country). All respondents

commented on the sporadic, unpredictable nature of tail biting outbreaks and the fact that there was no definite solution when it does occur. Negative consequences included “seeing a good pig destroyed” with condemnation being the most destructive element for 79% of those surveyed, closely followed by loss of productivity. Most respondents felt that biting outbreaks were a “symptom of another problem” with pig health, stocking density, feed and ventilation felt to be the biggest triggers. Many of the respondents also believed that “boredom has a big effect on tail biting”; the majority of those surveyed (65%) found enrichment of importance in both reducing the incidences of tail biting outbreaks and stopping them it when it does occur.

Study 2: During the weaner stages there was no effect of enrichment type on tail lesion scores, but females tended to have worse scores and performed more harmful behaviour than males ($P < 0.001$). Female pigs performed more ear biting than males ($P < 0.001$) and pigs with straw blocks performed more than pigs with a plastic toy ($P < 0.01$). Male pigs were more aggressive than females ($P < 0.001$) and pigs interacted more the toy than the straw ($P < 0.001$). There was no effect of either enrichment type or sex on cortisol levels, nor was there an effect of either on tail lesion scores at the abattoir. The highest straw usage was recorded amongst the second weaner stage. The cost of straw was €0.46 per day (€0.37 per pig) in the first stage, €2.85 per day (€0.57 per pig) in the second stage and €0.21 per day (€0.58 per pig) in the finisher stage. During the novel arena and open field tests bitten pigs performed more behaviours indicative of fearfulness (e.g. screams, less time exploring) than non-bitten pigs, thus implying that not only is physical health, but also mental state, associated with being bitten.

Study 3: Beech was harder than all other types of wood ($P < 0.05$), larch was harder than spruce and Scots pine ($P < 0.001$), while spruce and Scots pine did not differ from each other. Spruce was consumed more quickly than other wood types in terms of weight loss and reduction in length ($P < 0.001$), and pigs were observed interacting with it more frequently than the other species ($P < 0.05$). Pigs also interacted with the wood more often than the chains in spruce allocated pens ($P < 0.001$). There was no treatment effect on the frequency of harmful behaviours (tail/ear/flank-biting), and or on tail or ear damage scores. There was a positive correlation between ear lesion and tear-staining scores ($P < 0.01$), and between tail lesion and tail posture scores ($P < 0.05$). Thus these measures may be useful on-farm indicators of welfare, particularly if pens are large and there is dirt on the tails. Wood type did not affect visceral condemnation level. Wood is a potentially suitable enrichment material, yet the species could influence its attractiveness to pigs.

Study 4: Tail lesions were higher in the spruce group ($P < 0.05$) although there no difference in terms of presence of blood on the tails scored, and in general the scores were extremely low (average of below 1 (mild lesions) for all treatments). No difference was found between treatments for ear lesions or tear staining scores. Salivary cortisol did not differ between treatments, but overall as the pigs grow bigger the salivary cortisol level increased ($P < 0.01$). Neither was a difference found on the performance of tail and ear biting separately or combined. Pigs provided with the rubber floor toy spent a higher percentage of time interacting with the enrichment compared to ones given beech ($P < 0.05$). This could in part be due to the fact that the toy was movable on the floor. This could have created more interaction between pigs, and made it easier to access than the wood, which was fixed to the wall. The results were similar to those in study 3, where the Beech, which is the hardest wood, was less appealing than the softer wood types. There was no difference in aggression at the enrichment devices or play behaviour. For the growth parameters, the average daily gain and feed conversion ratio were the same between treatments. No damage from splinter to the gum, tongue and mouth area was found related to using wood.

Study 5: Although average daily gain (ADG) was similar for pigs on both diets, during the finisher stage pigs fed the high fibre diet had a lower ADG (1.06 Kg/day) than those on the standard diet (1.09 Kg/day; $P < 0.05$). Nevertheless, both are within the normal range expected for finisher pigs, and higher than the average of the farms enrolled in the Teagasc eProfit monitor for 2017 (0.866 Kg/d). Pigs interacted more with the toy than the wood ($P < 0.05$), and there was also less tail directed behaviour in the Toy pens ($P < 0.05$). This implies that perhaps the Toy was more effective at attracting biting behaviour away from other pigs than the wood was. There was no effect of enrichment type or diet on tail or ear lesions, or tear scores. In the novel object test, bitten pigs took longer to approach the object than pigs that performed tail biting ($P < 0.05$), indicating increased fearfulness. This is similar to the previous results from the commercial farm. Pigs with the Toy approached the novel object faster than ones given wood, and spent a longer time interacting with it ($P < 0.05$), but this could have been because the NO was more similar to the floor toys and therefore was less novel and fearful for them. Finally, there were a total of 26 tail biting outbreaks during the experiment. As a first intervention, the success rate was the highest if the victim was removed ($n=6$ outbreaks). However if a third intervention was needed, removal of the biter was successful 100% of the time.

5. Opportunity/Benefit:

This project is extremely timely, and is of great importance to the industry from both an animal welfare and legislative perspective. In March 2016 the EU commission released a recommendation regarding management of tail biting in pigs, reiterating that enrichment materials should be edible, chewable, investigable, and manipulable (Commission Recommendation 2016/336), and they are currently managing a 3 year project to investigate compliance with legislation across Member States. The vast majority of research which has been carried out to date on enrichment has been in countries where either solid or partially solid floors are prevalent. Thus most experiments have included loose straw on the floor as at least one of the treatments, and this is considered the gold standard. Our research findings consist of the first body of work carried out in Ireland on the area of enrichment for growing pigs, using materials that are all appropriate for use in slatted systems.

By carrying out part of the project on commercial farms, we were able to demonstrate how our treatments functioned in an applied setting. This provides producers with accurate information about how effective the enrichment materials will be practically, and also means that there can be quick adoption of the best strategies. The results from the project will have contributed valuable information which will help producers to transition to rearing undocked pigs, and provided a basis for developing tail biting risk assessment and control protocols.

6. Dissemination:

The data have been disseminated through oral and poster presentations at the Pig Development Department research dissemination days, articles in the Teagasc pig newsletter, international conferences, in T-research, and will form part of a PhD thesis.

Main publications:

Chou, J.-Y., D'Eath, R.B., Sandercock, D.A., Waran, N., Haigh, A. and O'Driscoll, K. 2018. Use of different wood types as environmental enrichment to manage tail biting in docked pigs in a commercial fully-slatted system. *Livestock Science*. 213:19-27.

Haigh, A., Chou, J.-Y. and O'Driscoll, K. 2017. The effect of compressed straw on growing pig welfare in a commercial slatted system. *Animal In press*.

Haigh, A. and O'Driscoll, K. (2018). A survey of Irish producers regarding enrichment and tail docking in commercial pig farming. *Irish Veterinary Journal*. *Planned submission, Nov 2018*.

Popular publications:

O'Driscoll, K., Chou, J.-Y., and Haigh, A. (2017) Environmental enrichment for pigs. *Teagasc TResearch*, Vol 12., No. 3, Autumn.

7. Compiled by: Dr. Keelin O'Driscoll