Can slat-compatible enrichment influence pigs' behaviour and response to a disease challenge?

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SUMMARY

Rearing pigs in highly enriched environments with a greater space allowance and provision of substrates (straw, mushroom compost, sawdust, wood branches) for rooting and chewing has been found to reduce the disease susceptibility of pigs to co-infection with PRRSv and Actinobacillus pleuropneumoniae, increasing the speed of viral clearance and reducing the prevalence of lung lesions. However, provision of these types of substrates is not practical in fully slatted rearing systems and may present a biosecurity risk. Scientific evidence is limited and conflicting on the efficacy of chewable, inedible enrichments to influence the productivity, behaviour, or immune function of pigs. The aim of this work was to determine if provision of a rotation of slat compatible enrichments could beneficially influence the physiological responses of pigs when exposed to a disease challenge.

The provision of a rotation of inedible point-source enrichments to pigs reared in fully slatted housing increased the interaction with enrichment compared to provision of a single chain but was not effective at beneficially influencing the response of pigs to a natural disease challenge. The results of this work can help provide information for the development of sustainable and effective environmental enrichment practices that meet animal care requirements while supporting the health and economic viability of Canadian swine production.

INTRODUCTION

Disease is a leading cause of economic loss and reduced animal welfare in the swine industry. Breeding animals for greater disease resilience is one approach to make animals less susceptible to disease. However, the rearing environment may also interact to influence disease resilience, because stress influences the immune function. For pigs, enrichment can provide an outlet for the performance of species-specific behaviours like rooting and chewing for exploration and foraging, and in turn may reduce the likelihood of pigs redirecting nosing and biting pen-mates and pen fixtures, which could help to reduce chronic social stress within the group. Rearing pigs in highly enriched environments with a greater space allowance and provision of substrates (straw, mushroom compost, sawdust, wood branches) for rooting and chewing has been found to reduce the disease susceptibility of pigs to co-infection with Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) and Actinobacillus pleuropneumoniae, increasing the speed of viral clearance and reducing the prevalence of lung lesions (van Dixhoorn et al., 2016). However, provision of substrate is not practical in fully slatted rearing systems and may present a biosecurity risk. Instead, slat compatible enrichment such reusable commercial chewable pig 'toys' or materials such as natural rope, flexible PVC pipe or rubber are more readily provided to pigs in fully-slatted farms. However, scientific evidence is limited and conflicting on the efficacy of chewable, inedible enrichments to influence the productivity, behaviour, or immune function of pigs. The aim of this work was to determine if provision of a rotation of slat compatible enrichments could beneficially influence the physiological responses of pigs when exposed to a disease challenge.

EXPERIMENTAL PROCEDURES

Pigs (n=1220) were transported to the Deschambault Animal Sciences Research Centre (QC) at weaning and assigned to either a treatment group (Enriched) or control group. Enriched pens were reared with a rotation of seven different inedible point-source enrichment objects (Figure 1), with control pens receiving up to two metal chains as a basic enrichment. Point-source enrichment is an item of a limited size that is typically fixed in location, such as by suspending the enrichments. Each type of enrichment was presented to pigs one at a time at a rate of one enrichment object per seven pigs. To help support novelty and retain interest, objects were rotated three times weekly (Monday, Wednesday, Friday) so that each type of object was presented for two to three days at a time and then not re-presented to the pigs for a period of nine days.

At 37-40 days of age, pigs moved into a continuous flow barn and were exposed to a polymicrobial natural disease challenge for four weeks, after which they were transferred to a finisher barn where they remained until slaughter. The disease challenge exposed pigs to 12 different pathogens. Pens of pigs remained in their respective control and treatment groups throughout each growth period, with enriched pens continuing to receive a rotation of enrichment from nursery, through the disease challenge, and to grow-finish.

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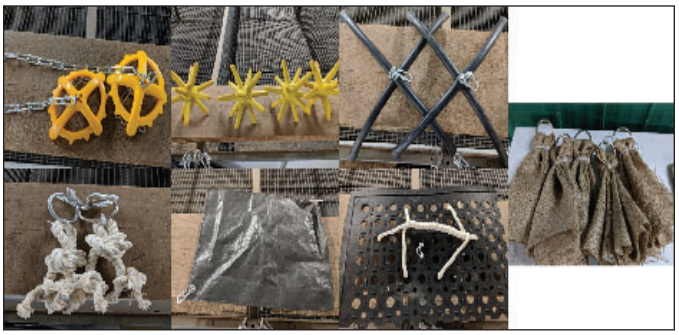

Figure 1. Point-source enrichment objects provided to growing swine during a natural disease challenge. One type of enrichment was provided at a time and the type of object presented was rotated three times weekly. Top row (left to right): 1) Porchichew (NutraPet, East Yorkshire, UK); 2) EasyFix Luna ((EasyFix, Ballinasloe, Ireland); 3) Flexible PVC pipe, 4) jute (burlap) sack. Bottom row (left to right): 5) cotton rope; 6) tarpaulin; 7) rubber rooting mat with cotton rope treaded through.

RESULTS AND DISCUSSION

Pigs provided with a rotation of point-source enrichments were more likely to interact with the objects than control pigs provided with only chains (Figure 2), but the probability of interaction with the point-source enrichment declined over time within each growth phase. Despite frequent rotation of the items, the enrichment objects were not able to generate a benefit to pig performance or response to disease challenge. This may be because the enrichment was not rewarding enough to the pigs. On the other hand, enriched pigs were more likely to be observed lying laterally (side lying) and less time standing and lying sternally (stomach lying), which could indicate that enriched pigs were resting more comfortably and spending less time awake and inactive.

Observations of individual social and exploratory behaviour performed on 70 pigs identified that enriched pigs were more active in the nursery phase, performing a greater amount of positive and negative social behaviours and more pen rooting than control pigs ($P<0.05$ for all). On day 13 of disease challenge, enriched pigs displayed greater levels of enrichment use ($P<0.001$) and negative social behaviour ($P=0.04$), but control and enriched pigs did not differ in positive social behaviour and pen rooting.

Relationships were found between the performance of specific behaviours and performance in the disease challenge in both control and enriched pigs. In both treatment groups, animals that performed a greater frequency of pen rooting during disease challenge had a greater average daily gain in the finisher phase ($P<0.01$). Within enriched pigs only, there was a moderate, positive relationship between the performance of pen rooting and positive social behaviour and higher counts of total white blood cells, lymphocytes, total red blood cells, and hemoglobin measured at day 42 post disease exposure. This suggests that pigs that perform functional (rooting) and positive social behaviour may perform better under challenge, showing a higher growth and quicker recovery.

IMPLICATIONS

The provision of a rotation of inedible point-source enrichments to pigs reared in fully slatted housing increased the interaction with enrichment compared to provision of a single chain and influenced pig behaviour but was not effective at beneficially influencing the response of pigs to a natural disease challenge. Further research on providing enrichment that sustains pig interaction, satisfies motivational needs, and can deliver biological benefits is warranted. This will ensure investments made into enrichment to meet Code of Practice requirements can deliver good benefits for welfare and for the producer. Relationships between individual pig behaviour and performance when under challenge suggests there is value in exploring this further, and such work may lead to developments in phenotypic measures for resilient animals.

The results of this work can help provide information for the development of sustainable and effective environmental enrichment practices that meet animal care requirements while supporting the health and economic viability of Canadian swine production.

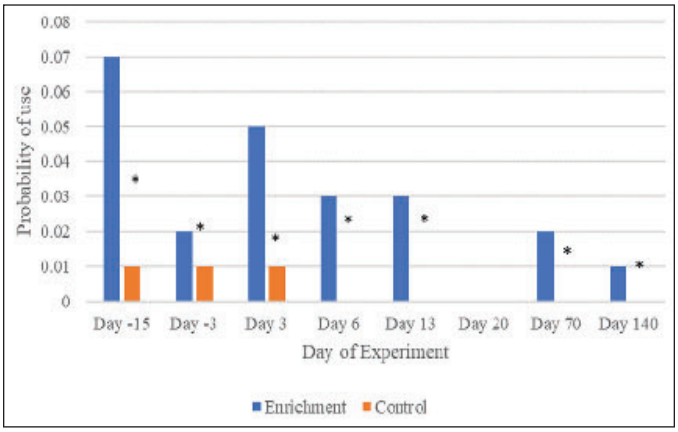

Figure 2. Probability of pens of pigs in interacting with a point-source enrichment object (Enrichment) or a metal chain (Control) during a two-hour observation period on sampling days within three experimental phases: nursery phase (Day -15, Day -3), disease challenge phase (Day 3, Day 6, Day 13, Day 20) and finisher phase (Day 70, Day 140). Statistically significant differences ($P<0.05$) between treatment groups are denoted by an asterisk (*).

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