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Straw applications in growing pigs: Effects on behavior, straw use and growth

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ABSTRACT

The short-term effects of four straw applications on pigs housed on slatted floors were investigated to determine differences in behavior, straw use and growth. Both the type of straw used and the design of the application might influence the attractiveness and effectiveness of the applications. To this end, four straw applications were tested simultaneously (1 application per pen), presenting them during two weeks to six pigs. This experimental set-up was repeated three times. The four applications tested were a straw dispenser (Funbar) with fully chopped straw, a MIK Toy (in rolls pressed chopped straw), a rack (long-stemmed straw) and a straw feeder (long-stemmed straw). All pigs (total $n = 96$) had ad libitum access to straw from one of the applications. Behavior was recorded using video cameras and analyzed per individual pig for week 1 and week 2 of each experimental set-up separately using the logistic mixed model.

The rack and straw feeder were explored and manipulated the most ($P = 0.02$). In addition, the duration of sustained contact with the application was longer in presence of these applications ($P = 0.0009$). This result might be related to the use of long straw. The straw use in presence of the rack was very high, with an average straw use of 2 kg per pen (6 pigs) per week. For all applications, direct contact with the application decreased during the second week compared to the first week. However, this decrease was the smallest in pens with the MIK Toy. Synchronized use of the applications was seen to a small extent, as in most cases not more than two pigs showed application interaction simultaneously. The presence of the Funbar (straw dispenser) was associated with a higher frequency of belly-nosing ($P = 0.03$), nosing other body-parts of pen mates ($P = 0.06$) and manipulating pen fittings ($P = 0.0002$). It has been shown that the use of chopped straw might be related to a higher frequency of manipulating pen-mates, but it is not clear whether the type of straw explains this result. Growth and the presence of skin lesions did not differ between the applications.

It can be concluded that the straw rack and feeder attract pigs to a larger extent. In addition, these applications are associated with longer durations of sustained contact. Straw use however is very high in presence of the rack. The Funbar straw dispenser is the least preferred application regarding behavioral effects. It seemed that this application did not offer growing pigs the same distraction as the other applications.

1. Introduction

Directive 2001/93/EC states that pigs should have permanent access to a sufficient quantity of material that enables manipulation activities (Council Directive 2001/93/EC, 2001). However, in a lot of countries including Belgium, a considerable proportion of fattening pigs is kept in pens without litter (Smulders et al., 2008). Such an environment hardly provides opportunities for exploration and manipulation. A lack of adequate material to manipulate may lead to redirection toward pen mates (Beattie et al., 2000; Scott et al., 2009; Sneddon et al., 2001), resulting in harmful behavior such as tail- and ear-biting. In the study of Smulders et al. (2008) 24.5% of the pens (3590 observed pens in 60 farms)

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contained one animal with tail or ear lesions. In addition to behavioral effects, a lack of enrichment material might also influence growth. It is seen that pigs with access to straw have a greater feed intake and consequently grow faster than pigs in pens without straw (Lyons et al., 1995). The same effect is seen when straw-bedded pens are compared with pens with a liquid dispenser and a commercial toy (Van de Weerd et al., 2006). Furthermore, different straw applications and types of straw might affect growth in varying degrees.

There are different enrichment materials which can satisfy the intended purposes but it can be questioned whether all these materials induce the same effect. Habituation to enrichment might occur (Driessen et al., 2008) and therefore these materials must meet the requirements of pigs. Previous research has shown that enrichment material for weaned and growing pigs should be ingestible, destructible, contained, not particulate and not rootable in order to keep their interest after 5 days (Van de Weerd et al., 2003). A full bed of straw seems to meet the behavioral needs of pigs and prevents the development of harmful behavior (Fraser et al., 1991; Van de Weerd et al., 2005). However, due to its incompatibility with current housing systems, it is hardly applied on pig farms. Indeed, the use of fully slatted floors inhibits the use of large amounts, as straw loss through the slats might block the slurry system. Furthermore, replenishing large amounts of substrate on a regular basis is labor intensive and costly. A daily provision of a limited amount of substrate or presenting it in a box or rack might offer a solution to this problem (Vanheukelom et al., 2011; Zonderland et al., 2008). Thus, there is a need for alternative applications providing straw, affecting the behavior of pigs in a positive way.

This study aims to verify the behavioral effects, straw use and effects on growth of four straw applications on pigs housed on fully-slatted floors. The hypothesis of this study is that the straw applications induce different behavioral effects and that straw use varies between applications.

2. Materials and methods

2.1. Animals and housing

A total of 96 growing Piétrain × Hypor crossbred pigs were used in this study, spread over four batches. Each batch was housed in the four experimental pens for two weeks. Each pen contained three female pigs and three castrated male pigs (0.79 m^2/pig). All pigs were tail docked within 3 days after birth. Prior to the experiments, the pigs were housed in commercial groups on fully-slatted floors having permanently access to a chain as enrichment material.

The experimental building was a controlled-environment building, containing 12 fully-slatted pens (1.96 × 2.43 m) in one room, located in two rows with an access passage between the two rows. Temperature in the building was aimed at 22 °C and variation in temperature was not measured. All groups were fed ad libitum with the same commercial dry feed (meal) from entry in the finishing pens to slaughter, according to the stage of life. From the start until 70 kg, pigs received feed with the following composition: 2370 kcal (NE), 88% dry matter, 14% crude protein, 0.81% total lysine and 5.3% crude fiber. From 70 kg until slaughter, pigs received other feed with the following composition: 2290 kcal (NE), 88% dry matter, 14% crude protein, 0.85% total lysine and 4.5% crude fiber. Water was freely available from a nipple drinker. Lights were on from 8:00 h to 17:00 h.

2.2. Enrichment objects and substrates

The applications chosen for this study all provided the pigs with straw (Table 1).

They were placed on eye-level of the pigs (50 cm height, excluding the straw feeder), in order to give them good access to the materials. One application was provided per pen. Each application was checked and refilled routinely every day. Per batch, the amount of straw used per application was recorded for week 1 and week 2 separately by weighing the remaining amount at the end of each week. In addition to one straw application, a chain was attached on top of the sidewall (height: 110 cm) of each pen.

2.3. Experimental procedure

Four pens in the experimental building were selected to house four groups of pigs, in order to simultaneously test the different applications (one application per pen). A chain as enrichment was also present in each pen. The first batch of pigs were weighed, marked with a color marked spray and housed on the first experimental day. They were weighed again and removed from the pens on day 14 clearing the ground for the second batch. The total duration of the experimental period was 2 months during which each application was tested four times, presenting them each time to a batch with other pigs. After each experimental period, pigs were moved from the experimental pens to the other pens in the same room. Start and end weights of the pigs differed between batches and were the following:

- Batch 1: 59.42 kg ± 0.799; 72.20 kg ± 0.892,
- Batch 2: 68.15 kg ± 0.696; 79.2 kg ± 1.20,
- Batch 3: 78.92 kg ± 0.803; 89.00 kg ± 1.01,
- Batch 4: 88.19 kg ± 0.866; 99.13 kg ± 1.14.

However, this factor was included as a fixed effect during statistical analysis.

In each of the four batches, applications were tested in different pens with different neighboring applications to avoid location effects. No pens without enrichment (control pens) were included in the experiment, as the aim of the study was to verify differences between applications. Furthermore, drinkers and all applications were checked in the morning and refilled when needed. Every two days, pigs were re-marked with the color spray to allow individual behavioral observations.

2.4. Lesion scores

Skin lesions on different body-parts (left and right shoulder, middle of body, ham, head) were scored individually on day 2 and day 9 of each experimental period using a four-point scale from 1 (no lesions) to 4 (extreme lesions) (based on Barton-Gade et al., 1995). At those 2 days, tail and ear lesions were also scored, using the score system of Zonderland et al. (2008) (Table 2).

2.5. Video observations

The behavior of the pigs was recorded using video cameras. These cameras were fitted on the ceiling above the pens. Although the room had windows, artificial light (8:00–17:00 h) was added to the natural daylight to permit optimal video recording and to permit correct identification of the individual animals. Videos from 6 days (days 2, 4, 6, 8, 10 and 12) within each experimental period were sampled to determine the level of interest in the applications and to determine their effect on behavior. With a one-minute interval, behavior at that moment was scored for each individual animal. Scoring of the behavior was loosely based on the ethogram developed by Hay et al. (2003). Behaviors related to tail and ear biting were based on the ethograms developed by Statham et al. (2011) and Brunberg et al. (2011) (Table 3). As pigs are more active during the afternoon, behavior was scored from 13:00 h until