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Nest-building behaviour and activity budgets of sows provided with different materials

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ABSTRACT

Domestic sows are still highly motivated to build a nest before farrowing. Many pig houses have slurry systems that do not allow use of long straw or other bulky materials that could block the drains, which provides an incentive to investigate the functionality of finer-grained materials for nest building. The objective of this study was to evaluate the effects of providing peat or straw on the overall amount of nest-building behaviour, number of different behavioural elements performed during nest building, and behavioural time budget of sows in the nesting period before farrowing.

Fifty-four hybrid sows (Norwegian Landrace x Yorkshire) ranging in parity from 1 to 9 (mean ± S.E., 2.9 ± 2.0), of which 16 were gilts, were loose-housed in individual farrowing pens. From two days before expected farrowing until farrowing the sows received nest-building material, with refills if necessary: peat (4 kg, 2 kg refills, n = 18), straw (2 kg, 1 kg refills, n = 17), or served as controls (n = 16). Behaviour in the last 12 h before onset of farrowing was instantaneously scan sampled at 5-min intervals from video recordings of each sow.

Sows provided with straw or peat engaged in nest-building behaviour in a higher proportion of scans compared to the sows in the control group ($P < 0.001$), and the sows in the straw group displayed the highest number of nest-building elements ($P < 0.001$). Sows in the straw group also lied more ($P < 0.001$) and performed less stereotypic behaviour ($P < 0.001$) than sows in the other two groups. Overall, total nest-building behaviour increased to a peak at 6–4 h before farrowing and declined in the final three hours ($P < 0.001$). The number of different nest-building elements followed the same pattern ($P = 0.032$). Sows of parity ≥4 (n = 16) exhibited more nest-building behaviour compared to gilts and sows of parity 2–3 ($P < 0.001$).

Our results demonstrate that both straw and peat stimulated more nest building compared to the control condition. However, straw elicited more complex nest-building behaviour, increased lying time and reduced time spent on stereotypies in the 12 h before farrowing, suggesting that straw has a better function as nest-building material than peat.

1. Introduction

Although pigs are domesticated and most live indoors sheltered from climatic factors and predators, sows are still motivated to build a nest before farrowing (e.g. Wischner et al., 2009). In a semi-natural environment, the sow leaves the group a day before farrowing to seek a suitable nest site (Jensen, 1986). In the initial nest-building phase, the sow digs a depression in the ground by pawing with the front legs and rooting with the snout. Subsequently she collects and carries vegetation such as grass and branches to the nest site, and arranges the material before she lies down to rest (Jensen, 1986, 1993; Mayer et al., 2002). Nest building has been reported to be most intensive during the last 12 h before farrowing (Castrén et al., 1993; Jensen, 1993). The onset of nest building behaviour is associated with a rise in prolactin levels (Castrén et al., 1993), which is induced by a decrease in progesterone and an increase in prostaglandins (Algers and Uvnäs-Moberg, 2007). Nest construction is dependent on external stimuli such as nesting materials (Jensen, 1993), and Jensen (1989) suggested that sows could learn to build a better nest with age or experience, though elements of nest-building behaviour occur even when sows are provided with a premade nest (Arey et al., 1991). However, Andersen et al. (2014) found that crated sows spent less time nest building, and showed more

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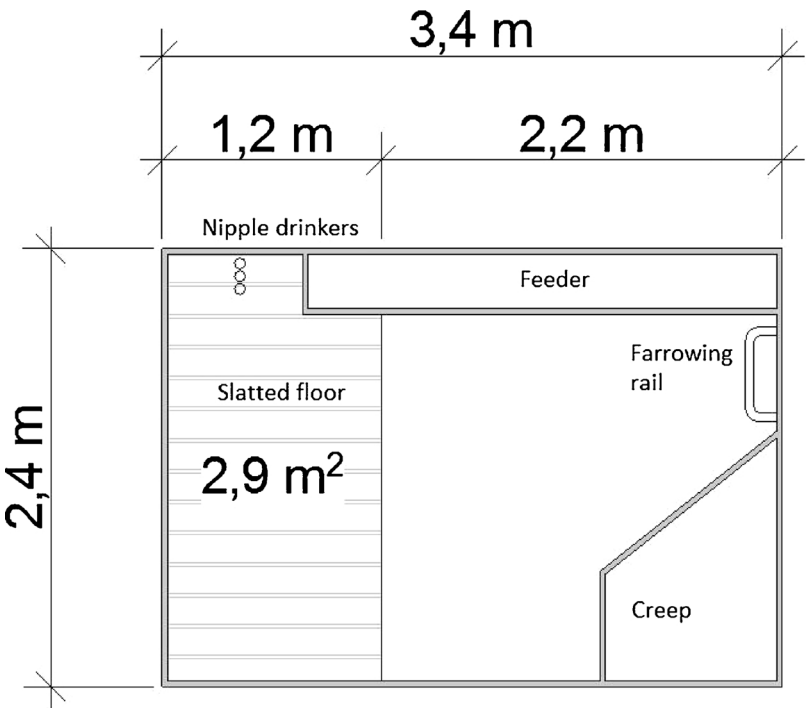

Fig. 1. The design of the farrowing pen.

behaviours related to restlessness and frustration, than sows loose-housed in pens despite being provided with the same amount of straw. Also, the research by Hansen et al. (2017) showed that loose-housed sows performed a higher proportion of nest-building behaviour in the nesting period compared to confined sows. This indicates that suitable materials and ability to move are both important for the full expression of nest-building behaviour.

Previous studies have investigated the effects of different materials or environmental stimuli on nest building. These have included straw, cloth tassels, branches, sawdust, sand bedding, and a pen cover, with long-cut straw and branches stimulating the most nest-building behaviour (Widowski and Curtis, 1990; Cronin et al., 1993; Thodberg et al., 1999; Damm et al., 2000; Damm et al., 2010; Westin et al., 2015). Many pig houses have slurry systems that will not allow use of long straw or other materials that could block the drains. Some farmers also consider that when straw is provided, too much labour is needed to maintain pen cleanliness. Therefore, peat is of interest as a nest-building material in regions where it is readily available, and where straw is of variable availability. The combined effects of providing peat bedding covered with a thin layer of straw along with racks of straw and branches were investigated in one study (Damm et al., 2002). However, reports on the effectiveness of peat as a nest-building material in the absence of straw are lacking. The structure of peat is very similar to soil, and peat is used as an environmental enrichment for pigs as it is suitable for rooting, digging and pawing (Studnitz et al., 2007; Vanheukelom et al., 2011), which are also elements of nest building.

Our objective was to study the effects of providing peat, straw or no nest-building material (control) on the overall amount of nest-building behaviour, number of different nest-building elements performed, and the activity budget of sows in the nest-building period before farrowing. The study was conducted under loose-housing conditions that allowed sows freedom of movement to express nest-building behaviour. We predicted that provision of either peat or long-stemmed straw would result in more nest-building behaviour, and a larger variety of nest-building behavioural elements, than when no nesting material was added. Due to the structural differences between straw and peat, with straw enabling the construction of a more complex nest, we expected to observe more nest-building behaviour and a larger number of nest-building elements in the straw treatment. Consequently, sows with access to straw were predicted to spend less time on other activities, including stereotypies, and lie more than sows in the other treatments. Finally, based on previously reported correlations between nest-building and sow parity, body size and age (Jensen, 1989; Widowski and Curtis, 1990; Mayer et al., 2002), we predicted that time spent in nest-building behaviour would increase with parity.

2. Material and methods

2.1. Experimental design

During three farrowing batches, 54 loose-housed sows kept in individual farrowing pens were video recorded from two days pre-partum until the start of farrowing to document the sows' pre-partum nest-building behaviour and activity budget. The sows were randomly assigned to one of three treatment groups differing in nest-building material: peat, straw and control (no nest-building material), with 18 sows in each group. The final sample sizes were 18, 17 and 16 respectively, due to failure of video recordings of two sows and abortion by one sow.

2.2. Animals and housing

The study took place at Mære Agricultural College in Steinkjer, Norway. The sows were Norwegian Landrace x Yorkshire, ranging in parity from 1 to 9 (mean ± S.E., 2.9 ± 2.0), of which 16 were gilts. They were inseminated with semen from Duroc boars. Approximately 3–4 weeks before farrowing, they were moved from group gestation pens to individual farrowing pens with an area of 8.2 m^2, of which 2.9 m^2 was slatted flooring (Fig. 1). According to standard practice in Norway, no farrowings were artificially induced, and no laxatives were added to the diet prior to farrowing.

The farrowing unit was insulated, and mechanically ventilated. The room temperature was regulated to 20 °C, and the pen creep area was equipped with heat lamps and floor heating kept at 35 °C. The indoor air temperature was measured by two temperature loggers (Tinytag, Gemini Data Loggers, Chichester, UK) placed in different parts of the farrowing unit. Due to variation in the outdoor temperature, indoor temperature differed between the batches. From one day before the first farrowing until the last farrowing (8 days), the average temperature