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Evaluating measures of exploratory behaviour in sows around farrowing and during lactation—A pilot study

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ABSTRACT

There are very few studies on the need to perform exploratory behaviour of sows around farrowing and during lactation, except for during the nest-building period. Exploratory behaviour in pigs may reflect appetitive foraging motivated by hunger, or appetitive behaviour related to other motivations, such as nest building. However, exploration may also be motivated by curiosity, stimulated by novelty or search for novelty. The aim of this study was to test novel methods of evaluating exploratory motivation in sows around farrowing and during lactation. We used ten second or third parity sows, housed in conventional crates from day 8 before expected farrowing until weaning, on day 28 after farrowing. Motivation to perform exploratory behaviour was evaluated by measuring the use of a manipulable and chewable object (a wooden device, MCO) and responses during a novel object test (NO). In addition, we studied if exploratory motivation is related to the energy status of the sow, measured as sow weight change during lactation, piglet weight gain, and leptin level in saliva. The exploratory motivation of sows appeared to change during the period of study. Although all sows used the MCO, the use was very low throughout the study (below 3 g per day on average), and almost non-existent during the first weeks after farrowing. The latency to touch the object in the NO test was correlated between test days before and after farrowing, while the sow showed more interest in the object before than after farrowing. MCO use during the last week of lactation was higher in sows with a lower weight after weaning, suggesting a link between explorative motivation and energy status in the sow. These results indicate a need for further studies on how to best meet the possible exploratory need of sows during their time in the farrowing room.

1. Introduction

In intensive pig production slatted floors and liquid manure management makes it difficult to use straw, or similar manipulable and destructible material for pigs, which provides a suitable outlet for exploratory motivation (Bracke et al., 2006; Studnitz et al., 2007). Lack of manipulable material has been discussed mostly in relation to growing pigs (Vanheukelom et al., 2012), likely due to the fact that this is closely related to the problem of tail biting in this age group (European Food Safety Authority, 2014; D'Eath et al., 2014). However, access to appropriate manipulative material might also be crucial for the welfare of gestating sows (Munsterhjelm et al., 2015), and is certainly important for pre-farrowing sows during the nest building phase (for a review, see Yun and Valros, 2015).

Very few studies have looked at behaviour directed towards manipulable materials in sows during late gestation and lactation, except in relation to nest-building. Bulens et al. (2014) found that crated sows used only a very small amount of straw from a straw dispenser, both before and after farrowing. These authors did, however, speculate that this might have been due to the sows having little experience extracting straw from the dispenser. In a small pilot study we found that lactating sows in crates manipulated a piece of fresh wood hanging above the feeding trough very little (Telkänranta et al., *unpublished)*. This was surprising, as similar wood pieces were manipulated frequently by fattening pigs, and also reduced the level of tail biting in these pigs (Telkänranta et al., 2014). However, the low use of the wood pieces in sows may have been due to suboptimal location of the wood. Farrowing crates greatly limit sow movements, and thus also restrict the possibilities of sows to fulfil several needs, such as for nest-building (as reviewed by Yun and Valros, 2015). However, as crates are widely used, there is a need for further investigation of how to provide materials for sows in farrowing crates and the explorative motivation in these sows in general.

In pregnant sows it has been suggested that exploratory behaviour is mainly appetitive foraging, due to restrictive feeding, resulting in sows experiencing high levels of hunger during this period (European Food

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Safety Authority, 2014). During lactation sows are usually fed ad libitum, and should not experience hunger as such. However, due to milk production there are high metabolic demands on sows during this period (Valros et al., 2003a). Even ad libitum feeding may not be enough to meet the nutritional needs of sows during this period of high metabolic demand. In addition to hunger, exploration may also be motivated by curiosity, representing a search for or interest in novelty, but the distinction between appetitive foraging behaviour and curiosity-motivated exploratory behaviour may be difficult to make (Studnitz et al., 2007). Several experimental studies show that pigs tend to be more interested in investigating novel objects than familiar ones (Wood-Gush and Vestergaard, 1991; Moustgaard et al., 2002; Kornum et al., 2007). Further, just before farrowing, sows are highly motivated to nest build, which increases their use of manipulable materials, such as straw (Haskell and Hutson, 1996). The exploratory activity of sows, and the motivation behind it, can thus be expected to change during the physiologically diverse period the sows spend in the farrowing unit.

If exploratory motivation in sows is mainly related to feeding motivation (European Food Safety Authority, 2014), it could be expected that exploratory behaviour is linked to measures related to the energy status of the sow. Sows generally lose weight during lactation due to the high demand for milk production (Valros et al., 2003a). The level of weight loss is individual, and associated to the energy status of the sow pre-farrowing (Prunier et al., 2001). Weight loss during lactation, weight at weaning, and milk production, indirectly measured as piglet growth, thus give crude indications of the energy status of the lactating sows. The hormone leptin, which is mainly produced in the adipose tissue, is involved in regulating feeding motivation and is positively related to energy status of the individual (Gautron and Elmquist, 2011). In sows, leptin level has been shown to be related to level of backfat and to long-term feeding level (Prunier et al., 2001; Summer et al., 2009; Cools et al., 2013). Leptin level is thus a potential indicator of long-term energy status.

The aim of this study was to test novel methods of evaluating the exploratory motivation of sows during the period from late gestation to weaning. We evaluated the use of a wooden manipulable and chewable device and the interest in novel objects, focusing on changes throughout the study period. In addition, we studied measures related to the energy status of the sows: weight, weight loss, piglet growth and leptin level, to make preliminary observations on a possible positive association between exploratory motivation and low energy status of the sow.

2. Material and methods

The study complied with a protocol approved by the Danish Animal Experiments Inspectorate (2013–15–2934–00822).

2.1. Animals, housing and management

The study was performed at Aarhus University, AU-Foulum, Denmark, in the period May to July 2015, and included 10 clinically healthy 2 or 3 parity (Danish crossbred Landrace x Yorkshire) sows. All sows originated from the same herd and had been crated during farrowing in earlier parities. Approximately 4 weeks before expected farrowing the sows were brought to the research centre and were group housed until approximately 2 weeks before expected farrowing. Here they were moved to individual farrowing pens, and further to farrowing crates on day 8 before expected farrowing. On day 23 after farrowing, five randomly selected sows were moved to farrowing pens, as part of another study. The piglets were weaned at 25–29 days (average 26.8) of age.

All the sows were housed in one climate-controlled farrowing room in identical farrowing crates of 4.8 m^2 in size including 2.1 m^2 of slatted floor and a 0.6 m^2 creep area (Fig. 1). The covered creep areas were placed either to the right or left in the front corner of the pen. The farrowing pens were 6.6 m^2 including a 2.7 m^2 slatted floor area and a creep area of 0.87 m^2. The creep areas in both crates and pens had a 2.5 cm thick rubber mat as surface and a heat source, which was turned off 10 days after farrowing.

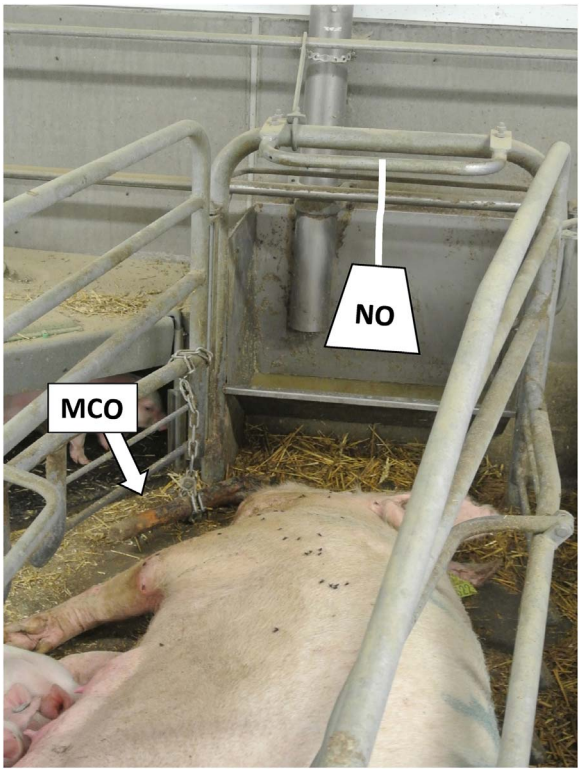

Fig. 1. Illustration of the position of the manipulable and chewable object (MCO) and the novel object (NO) during the novel object test.

Sows were fed three times a day at 0800 h, 1600 h, and 2100 h. During gestation the sows were fed 3.4 kg/day with a standard diet for gestating sows of (12% CP, 102 FE/kg = 7.9 MJ PPE/kg). During lactation the feed was a standard diet for lactating sows (14.1% CP, 8.2 MJ PPE/kg), and the sows received 2.5 kg at the day of expected farrowing. Every day after farrowing the ration was evaluated and was increased or decreased according to the requirements of the individual sow, which was assessed based on a visual assessment of left over feed. Individual feed intake was not measured. Furthermore, sows received 200 g of chopped wheat straw daily, placed on the floor near the head of the sow, but not in contact with the creep area. From day 10 after birth the piglets were provided with a solid feed ad libitum. From day 115 of gestation of the first expected farrowing until the last sow had farrowed in the room, the light was turned on during 24 h a day; this was necessary to record the farrowing times on video for another study. After the last farrowing in a room, the light was on from 0600 to 1800 h. A small window brought in natural daylight.

Eight sows gave birth to more than 14 piglets and the first morning after farrowing, the litter size of these was standardised to 14 piglets by taking randomly selected piglets from the litter to be fostered by non-experimental sows. Two sows gave birth to only 13 live-born piglets, and no piglets were added to these litters. The piglets were earmarked and within five days after farrowing, the males were castrated.

2.2. Data collection and sampling procedures

Piglet weights were recorded from the actual days after farrowing while all other measures are in relation to the expected farrowing date, giving a variation of −1 to +3 days in relation to actual farrowing date. The sampling and testing schedule is illustrated in Fig. 2.