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Sow free farrowing behaviour: Experiential, seasonal and individual variation

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ABSTRACT

Although sow confinement at farrowing is inherently stressful, farrowing crates remain in widespread commercial use. Sows adapt to their environment, however adaptation may be counter-productive if the farrowing system changes. The current study observed the behaviour of second parity sows throughout farrowing in a straw pen system to determine if their previous farrowing experience, in either the same pen system (n = 11) or a temporary confinement crate system (n = 11), affected current nest-building, farrowing and nursing behaviour. Data were analysed using PROC MIXED, with sow ID as the repeated subject. Sows which previously farrowed in pens tended to have a higher pre-partum peak nesting intensity ($P = 0.081$), and throughout parturition exhibited increased lateral lying ($P < 0.01$), decreased ventral lying ($P < 0.001$), decreased sitting ($P < 0.01$) and a decreased frequency of dangerous posture changes ($P < 0.05$). Post-partum, sows that previously farrowed in pens had a lower percentage of sow-terminated nursing ($P < 0.01$), a longer average duration of successful nursing bouts ($P < 0.05$) and a lower frequency of sow-terminated nursing bouts ($P < 0.001$). Seasonal effects were also seen in this naturally-ventilated system, both pre- and post-partum, with autumn/winter farrowings associated with more pre-partum nesting ($P < 0.01$), a higher pre-partum peak nesting intensity ($P < 0.05$), a longer average duration of successful nursing ($P < 0.05$) and a higher percentage of nursing bouts ending with piglets asleep at the udder ($P < 0.05$) than in the spring/summer. Individual variation in pre-partum nesting behaviour was associated with differences in parturient and post-partum behaviours. The results show that the prior experience of confinement, or a change of farrowing system, significantly affects sow farrowing behaviour in free farrowing pens, which may compromise the welfare of both sows and piglets.

1. Introduction

Research has demonstrated that prolonged confinement of the farrowing sow causes physiological stress and compromises sow welfare (Jarvis et al., 2006), however farrowing crates remain the predominant system used throughout farrowing and lactation on commercial indoor pig farms (Baxter and Edwards, 2016). Although three countries have banned the use of farrowing crates (Norway, Sweden and Switzerland), in other countries concerns about increased piglet mortality in free farrowing systems remain (e.g. the UK, FAWC, 2015). Whilst the primary reason for sow confinement is to reduce the risk of piglet crushing (FAWC, 2015), some surveys of commercial farms have found no significant benefit of using crated farrowing systems in reducing overall piglet mortality (Weber et al., 2009; KilBride et al., 2012).

Whilst temporary confinement systems, whereby the sow is confinedin a crate from entry into the farrowing house until approximately 2–7 days post-partum, provide a compromise between the requirements of farmers and livestock, the sows' behavioural need to perform pre-partum nest-building behaviours is rarely met in such systems. Pre-partum, confined sows without access to suitable substrates will still attempt to perform nest-building behaviour and show increased physiological stress responses (Lawrence et al., 1994; Damm et al., 2003), which may result in a prolonged farrowing duration (Wülbers-Mindermann et al., 2002; Oliviero et al., 2008) and increased savaging of piglets by gilts (Jarvis et al., 2004). Provision for pre-partum nest-building has further benefits for the new-born piglets, being associated with improved maternal responsiveness to piglet distress calls (Herskin et al., 1998; Thodberg et al., 2002a), enhanced piglet serum IgG and IgM levels from increased colostrum intake (Yun et al., 2014) and reduced pre-weaning piglet mortality (Cronin and Van Amerongen, 1991).

Although sow pre-partum nesting behaviours are affected by the

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immediate farrowing environment, including seasonal climatic variations (Jensen, 1989), behaviour also develops over successive parities as the sow adapts to repeated housing in the same system (Damm et al., 2003; Jarvis et al., 2001; Thodberg et al., 2002a). This may also be true post-partum, as the maternal behaviour of previously crated and penned sows remained dissimilar when subsequently housed in the same farrowing system (Thodberg et al., 2002b), demonstrating that prior confinement may impact the development of sow farrowing behaviour. However, no differences in pre-partum or maternal behaviours were observed amongst outdoor sows which were previously housed outdoors or in indoor pens (Wülbers-Mindermann et al., 2015). Whilst the majority of commercial sows return to the same farrowing system throughout their reproductive life, some farms move sows between farrowing systems in consecutive parities, especially as interest in alternatives to conventional farrowing crates increases and new systems are trialled or adopted. However, a change of farrowing system is postulated to be detrimental for sow welfare (RSPCA, 2016), may disrupt the appropriate adaptation of sow farrowing behaviours to the farrowing system over successive parities and ultimately result in increased pre-weaning piglet mortality (King et al., 2018).

The purpose of the current study was to investigate the effect of the first parity farrowing system, either a temporary confinement crate system or straw-based free farrowing pen, on the pre-partum nesting, farrowing and post-partum nursing behaviour during the second parity when all sows were housed in the same straw-based free farrowing system. As the farrowing system used was in a naturally ventilated building and thus subject to seasonal temperature fluctuations, behavioural observations were conducted throughout the year to determine any seasonal variation in sow farrowing behaviours. The effect of individual differences in pre-partum nest-building behaviour on partum and post-partum behaviour was also explored.

2. Materials and methods

2.1. Animals and dry sow management

Data were collected on a commercial pig breeding unit in the north east of England. The farm consisted of 1300 Camborough (Genus PIC, Basingstoke) breeding gilts and sows, bred with Hampshire semen collected on-site for artificial insemination. During gestation, all animals were kept in straw pens in groups according to body size. Animals were generally moved into the farrowing accommodation one week before their expected farrowing date.

2.2. Farrowing sow housing and management

During farrowing and lactation, second parity sows were housed in a straw-based free farrowing pen (Fig. 1a), whilst for their previous farrowing they had either been housed in the same farrowing system (pens) or a temporary crate system (360 s; 360 °Freedom Farrower®, Midland Pig Producers, Burton-on-Trent; Fig. 1b and see King et al., 2018 for images and full details of this system).

Pens were in rows of individual units, each consisting of a 2.30 m x 1.20 m indoor nest area with adjacent 2.30 m x 0.70 m separate covered piglet creep area and access to a 2.55 m x 2.00 m outdoor run (Fig. 1a). Pens had a solid concrete floor throughout, whilst the nest area contained farrowing rails and piglet protection bars across three sides to reduce piglet crushing risk. The nest area contained 5 kg of long straw from the day of sow entry into the farrowing system, whilst the entire creep floor was covered in wood shavings. The pens had no ambient temperature controls, however a 400 w electric heater was located at one end of each creep, these being individually switched off three to five days post-partum. Pens were routinely cleaned out weekly with straw and wood shavings replenished. Pre-partum, additional straw or wood shavings were added to nests when required and soiled straw was removed and replenished post-partum.

The 360 s comprised of a stainless steel crate (2.50 m x 0.90 m when closed, 2.50 m x 1.60 m at sow shoulder height when opened) within a 2.50 m x 1.80 m pen (Fig. 1b). The 360 s had plastic slatted flooring with a solid panel containing drainage slots in the sow lying area plus a 1.80 m x 0.40 m heat pad to one side of the crate. Two parallel vertical bars were positioned at the rear of the crate for additional piglet protection. The 360 s crates were closed from sow entry into the farrowing house until approx. ten days post-partum, with no nesting materials provided. Buildings containing 360 s were kept at 22 ± 1 °C, with the additional heat mat along one side of each pen starting at 36 °C and reducing to 30 °C by weaning. Room temperature was gradually reduced automatically to 18 ± 1 °C by day ten post-partum and to 16 ± 1 °C by weaning.

2.3. Farrowing sow and piglet husbandry

Sows were hand-fed once daily in the morning, onto the floor of the nest area in straw pens or troughs in the 360 s, until all sows in a building had farrowed, after which sows were fed twice a day (diet composition: 15.98% CP, 13.69 MJ DE/Kg). Feed was gradually increased from 1 kg to 6 kg per sow per day throughout lactation, whilst water was provided ad libitum, either from drinkers above the trough in the 360 s or from a floor trough in the outdoor area of the pens (Fig. 1a and b). A handful of creep feed (Primary Diets, AB Agri Ltd, Peterborough; followed by Flat Deck, A-One Feed Supplements Ltd, Thirsk) was provided once daily on the floor in all systems from approx. ten days of age until weaning.

In accordance with veterinary recommendation for this farm, piglets were tail docked, teeth clipped, and injected with 1 ml of Gleptosil (Ceva Animal Health Ltd, Amersham) and 0.5 ml of Betamox (Norbrook Laboratories Ltd, Newry) within 24 h of birth. Placenta and deceased piglets were also removed at this time, and live litter size was equalised for both piglet number and size by cross-fostering piglets of a similar age. The farm's management routines included piglet fostering, which occurred throughout lactation as necessary to ensure piglet and litter sizes remained similar.

2.4. Experimental design

The behaviours of 22 sows were recorded during their second parity when all sows farrowed in straw pens, using a 2 × 2 factorial design for the previous farrowing system (pens or 360 s) and current season (spring/summer = Apr-Sep, autumn/winter = Oct-Mar) to produce four combination groups – pens-spring/summer (n = 6), pens-autumn/winter (n = 5), 360 s-spring/summer (n = 5) and 360 s-autumn/winter (n = 6). This subgroup of sows was selected for behavioural observation from our preceding larger study investigating the effect of the previous farrowing system on piglet mortality (King et al., 2018).

2.5. Data collection

Behavioural observations were recorded during the period from January 2015 to July 2016. CCTV cameras (Gamut Professional Sony Effio E Bullet CCTV Camera 700 TV Line, 15 m Infrared Night Vision (Gamut, Open24 seven Ltd, Bristol, UK)) were installed above each pen to observe the indoor nest area only. Cameras recorded continuously from two days before until two days after farrowing. From the video recordings, time of birth of first piglet (BFP) was identified, with the period of analysis for nesting behaviour comprising the 24 h before BFP, farrowing behaviour analysis from the BFP until the last liveborn piglet, and the post-partum nursing observation occurring from 24 h until 48 h after the birth of the last live born piglet. Video data were analysed for all 22 sows during the nesting period, however three sows were excluded from some parts of analysis due to spending a significant proportion of time out of view in the outside area (two sows during parturition: one from each of the previous systems; one sow post-partum: