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Post-mortem findings and piglet mortality in relation to strategic use of straw at farrowing

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ABSTRACT

Piglet survival is the outcome of complex interactions between the sow, the piglet and their environment. In order to facilitate nest-building and to provide a suitable environment for the newborn piglets, a strategic method to supply loose housed sows with large quantities of straw at farrowing has been developed by Swedish piglet-producing farmers. The objectives of this cohort study were to use post-mortem findings to assess the causes of death and to quantify the effect of a large quantity of straw provided before farrowing compared to limited small daily amounts on stillbirths, post-mortem findings in piglets dying within 5 days after birth and the pre-weaning mortality. On each of four commercial piglet-producing farms in South-West Sweden, one batch of sows was studied during two consecutive lactations. At inclusion, sows were randomly assigned to two treatment groups, and sows remaining in the batch during the next lactation switched treatment group. In the STRAW group ($n = 181$ litters) sows were provided with 15–20 kg of chopped straw 2 days prior to the calculated date of farrowing. Sows in the CONTROL group ($n = 182$ litters) received 0.5–1 kg of chopped straw on a daily basis plus about 2 kg for nest-building when the stockperson judged the sow to be about to farrow. After onset of farrowing, additionally 1–2 kg was given. Post-mortem examination was performed in all piglets that died within 5 days after birth ($n = 798$). The three major post-mortem findings were starvation (34%) crushing by the sow (28%), and enteritis (24%). In conclusion, strategic use of large quantities of straw reduced the number of stillborn piglets per litter by 27% ($p = 0.007$). Under the conditions studied, the pre-weaning mortality of liveborn piglets was not affected by treatment; however, the distribution of post-mortem findings differed with fewer piglets dying due to starvation and more due to crushing and enteritis in STRAW litters.

1. Introduction

Piglet survival is the outcome of complex interactions between the sow, the piglet and the environment (Edwards, 2002), and high pre-weaning mortality is a well-known phenomenon within piglet production. Starvation and crushing, both closely linked to perinatal asphyxia and hypothermia, are the most common ultimate causes of death in liveborn piglets (reviewed by: Alonso-Spilsbury et al., 2007; Edwards, 2002; Herpin et al., 2002).

Through the decades, different approaches have been tried in order to reduce piglet mortality. Commercial strategies have often focused on modifying the farrowing

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environment to affect sow behaviour and increase human intervention (Edwards, 2002). In spite of this, higher numbers of piglets weaned are still being achieved by increasing prolificacy rather than by reducing mortality (Kirkden et al., 2013). The amount of research focusing on individual piglet traits and their importance for survival is increasing. Studies focusing on maternal abilities and management routines, such as provision of nest material, are less frequent. An association between increased nest-building and reduced mortality has been found in some studies (Andersen et al., 2005; Cronin and van Amerongen, 1991) but not in others (Cronin and Smith, 1992; Edwards and Furniss, 1988).

In Sweden, piglet-producing farmers have developed a method for a strategic use of large quantities of straw at farrowing for loose housed sows. These farmers supply their sows with 15–20 kg of chopped straw once at 2 days prior to the calculated date of farrowing. Gradually the straw drains through the slatted floor (Westin et al., 2013) and is then replaced by a daily supply of 0.5–1 kg straw in accordance with common Swedish management routines. One purpose is to facilitate nest-building for the sow. A second goal is to provide a suitable environment for the piglets at birth. The method is proven to be technically feasible (Westin et al., 2013), to prevent bruising on claws and limbs and increase weight gain in piglets (Westin et al., 2014) and to increase the amount of nest-building performed pre-partum (Westin et al., 2015).

Oxytocin plays an important part in termination of the nest building phase as well as in the farrowing process and lactation in sows (Algers and Uvnäs-Moberg, 2007). Oxytocin also stimulates maternal interaction and attachment between mother and young (Uvnäs-Moberg et al., 2001). Use of farrowing crates during nest building and farrowing has been demonstrated to cause physiological stress responses in sows (Jarvis et al., 1997; Oliviero et al., 2008) and to prolong the farrowing duration possibly through an inhibition of oxytocin (Oliviero et al., 2008). In the present study we hypothesised that permitting the sow to express her natural nest-building behaviour by introduction of "strategic use of straw" will reduce the sow's potential stress-level compared to when given limited access to straw. Through hormonal regulation, this will have a positive effect on the farrowing process resulting in fewer stillbirths; and on the maternal behaviour reducing the number of piglets dying due to crushing. We also hypothesised that a more suitable micro-climate in pens with large amounts of straw will reduce the risk for hypothermia, resulting in less weak piglets dying from starvation. Altogether, we hypothesised that strategic use of straw will reduce the overall pre-weaning mortality in liveborn piglets.

The objectives of the present study were therefore to quantify the effect of a large quantity of straw (15–20 kg) given before farrowing, compared to small daily amounts (0.5–1 kg), on:

(a) the number of stillborn piglets;
(b) post-mortem findings in piglets dying within 5 days after birth;
(c) the pre-weaning mortality in liveborn piglets.

2. Materials and methods

This study was approved by the Regional Ethics Committee for animal experiments in Gothenburg.

2.1. Farms, housing and management

The study was carried out in 2009 as four cohort trials on commercial piglet-producing farms (A, B, C and D) in South-West Sweden (Table 1). The farms were selected based on the following criteria: (a) farm situated within 50 km from the university campus in Skara; (b) liquid manure system capable of managing large quantities of straw; (c) piglet production based on batch-wise farrowing with at least 30 sows farrowing in the same batch; (d) all sows kept loose housed during farrowing and lactation; and (e) farmer and stockpersons willing to participate in the study.

During gestation, sows were group-housed in deep-litter straw systems with individual feeding stalls. Sows entered the farrowing unit 5–4 days before the first sow in the batch was expected to give birth. In the farrowing unit, all sows were loose housed in pens with solid concrete flooring in 50% of the total pen area and 50% slatted flooring. On all four farms, creep areas were open with floor heating and a heating lamp. The slurry systems were based on liquid manure with mechanically operated scrapers directly under the slatted floor. Feeding and management were in accordance with the farms' regular routines. Sows were routinely vaccinated against enterotoxigenic *Eschericha coli*, *Erysipelothrix rhusiopathiae* and porcine parvovirus.

Farrowing occurred spontaneously, i.e. without pharmaceutical induction. Male piglets were castrated within 7 days of age. Tail docking was not performed. The stockpersons were allowed to apply cross-fostering of piglets between litters within the same treatment group. All cross-fostered piglets were individually marked by making a small cut in one ear. All piglets were offered commercial piglet creep feed without antibiotics. Piglets were weaned at an average age of 5 weeks in accordance with current Swedish practice.

2.2. Treatments

Researchers assigned pens to treatments before the sows entered the farrowing unit during the first study period. Every second pen was allocated to receive a large amount of straw (STRAW) while the adjacent pens were allocated as controls, receiving small amounts (CONTROL). The farmer was then asked to distribute the sows across pens, without knowledge about pen assignment. Hence treatment was randomised and in each farrowing unit the sows were equally distributed between treatments. On each farm, 54–68 sows were studied during one or two consecutive lactations (Study period 1: farrowings between March 10 and June 6; Study period 2: farrowings between August 10 and November 3). One hundred and twenty sows remaining in the batch during the second lactation switched treatment group. In total, 181 litters with access to large amounts of straw at birth (STRAW) and 182

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