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Can body nosing in artificially reared piglets be reduced by sucking and massaging dummies?

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ABSTRACT

Selection for hyper-prolific sows has substantially increased litter size. Consequently, the number of piglets in a litter may exceed the number of functional teats. To solve this problem, surplus piglets may be removed from the sow 2 days after birth and raised artificially. However, these piglets show increased levels of oral behaviours, such as belly nosing, directed at other piglets. This behaviour resembles massaging and sucking at the sow's udder and thus is considered to be redirected suckling behaviour. The present study investigated whether oral behaviour directed at piglets can be reduced in artificially reared piglets by providing them with sucking and massaging dummies. In a two-by-two between-group factorial design, the artificial rearing pens were equipped with one of four treatments: a sucking dummy, a massaging dummy, a combined sucking–massaging dummy, or no dummy. The behaviour of 126 piglets (in 21 groups of 6 piglets) was scored from video by continuous focal observation lasting 90 min per piglet each on days 4 and 18 after introduction to the artificial rearing system. Data were analysed using linear mixed-effects models. Body nosing (composed of belly nosing and nosing on any other body part) increased from day 4 to 18 in all treatments, but piglets provided with a combined sucking–massaging dummy showed the smallest increase. Piglets spent more time nosing the combined dummy than the sucking or the massaging dummy. However, there was no causal inverse relationship between the duration of body nosing and dummy nosing. All but one piglet showed body nosing at least once. Resting, play-fighting, or oral manipulation of piglets (other than body nosing), dummies, and pen equipment were hardly affected by the treatments. Piglets with a combined dummy tended to have a longer average resting bout duration compared with piglets in other treatments. In conclusion, only the combined sucking–massaging dummy was effective in reducing the increase in body nosing over time. However, this reduction was rather small in absolute terms and the combined dummy did not prevent body nosing. The tested dummies were thus not successful in eliminating the redirected oral behaviour in artificially reared piglets.

1. Introduction

In recent years, the number of live born piglets increased steadily (SUISAG, 2006–2015; Tomiyama et al., 2011; Vidović et al., 2012) by selection for hyper-prolific sows. Consequently, the number of piglets in a litter may exceed that of functional teats. As sows lactate only for a short period of 10–20 s about once every hour (Fraser, 1980; Le Dividich et al., 2005), piglets without access to a teat will suffer from low energy supply (Le Dividich et al., 2005), be more susceptible to diseases (Varley et al., 1985) and face a higher mortality risk than piglets with access (Dyck and Swierstra, 1987; Andersen et al., 2011; Devillers et al., 2011). Therefore, management intervention is needed to raise surplus piglets.

A common way to raise surplus piglets is cross-fostering. With this method, piglets are relocated from a prolific sow to another lactating sow with fewer piglets or to a nurse sow rearing a second litter after her own litter has been weaned (Baxter et al., 2013). Another approach is split-suckling. Large litters are split into subgroups of weak and strong piglets, and the stronger ones are removed for a short time to promote weaker piglets' access to the udder (Baxter et al., 2013). On small farms with few potential foster sows or to avoid the work effort needed for split-suckling, surplus piglets may be taken away from the mother sow

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as early as 2 days after birth (to ensure minimally required colostrum supply) and introduced to an artificial rearing system where they are fed artificial milk (Baxter et al., 2013).

When piglets are raised by the sow, a nursing bout consists of several phases (Fraser, 1980): After the piglets assemble at the udder, a first massaging phase lasting about 1 min induces milk let-down; it is followed by a sucking phase and terminated by a second massaging phase lasting several minutes. In piglets reared without the sow in an artificial rearing system, milk intake is changed markedly because the milk cups used for drinking lack the opportunity to massage an udder and suck on teats. Several studies have reported that piglets reared without a sow develop abnormal oral behaviour termed belly nosing (Weary et al., 1999; Rzezniczek et al., 2015) consisting of rhythmic up and down movements with the snout on the belly of other piglets (Fraser, 1978). Results from experimental studies suggested that belly nosing is not an indicator of stress (Gardner et al., 2001a), is not influenced by diet quality or the presence of milk in the diet (Gardner et al., 2001b), is more closely associated with social interaction than with eating or drinking (Li and Gonyou, 2002) and has a number of aspects similar to honest begging in birds (Jensen et al., 1998). As belly nosing is similar to the massaging and sucking movements of piglets at the sow's udder during nursing, it has been interpreted as redirected suckling behaviour (Fraser, 1978). The behaviour typically starts a few days after weaning (Fraser, 1978), increases in duration and frequency over 2–4 weeks and then declines (Gonyou et al., 1998; Worobec et al., 1999; Bench and Gonyou, 2009). In addition, the prevalence of belly nosing increases with decreasing weaning age (Metz and Gonyou, 1990; Worobec et al., 1999). About 80% of piglets weaned at the age of 2 weeks show belly nosing (Li and Gonyou, 2002). Artificially reared piglets furthermore show increased levels of other oral behaviours such as sucking and nibbling directed at other piglets, and durations of resting and play-fighting behaviour decrease over time (Rzezniczek et al., 2015).

Piglets do not show belly nosing when being reared by the sow (Rzezniczek et al., 2015). The development of this abnormal behaviour, therefore, indicates that the behavioural needs of the piglets are not met in artificial rearing systems. It is therefore of interest whether housing conditions in these systems could be improved to reduce the prevalence of belly nosing. To this end, Widowski et al. (2005) provided piglets removed from the sow at 3 days of age with various feeding devices such as a nipple mounted on a Plexiglas wall or a nipple mounted on a bag of water. They found that piglets fed with milk from these devices spent less time belly nosing and more time resting than piglets fed milk at a trough. Similarly, Bench and Gonyou (2007) enriched the pen environment for piglets weaned at 7 days of age with baby nipples in the milk feed through and reported that belly nosing and other oral behaviours were reduced in comparison with piglets reared without such enrichment. The aim of this study was to examine systematically whether providing either sucking, massaging, or combined sucking and massaging dummies to piglets reared without the sow reduces oral behaviour directed at other piglets. In contrast to previous studies, we focussed on a simple applicable solution to improve the housing conditions of surplus piglets in practice.

For this purpose, we separated piglets from the sow at the age of 3–5 days and raised them in artificial rearing systems equipped with a sucking dummy, a massaging dummy, a combined sucking–massaging dummy, or no dummy. We hypothesised that the occurrence of belly nosing and body nosing (composed of belly nosing and nosing on any other body part), would be less in piglets provided with dummies than in piglets without dummies and that the duration of body nosing would be inversely related to the duration of dummy nosing.

2. Materials and methods

Ethical approval for the implementation of the study, including housing, all treatments, and animal handling procedures, was given by the Thurgau Cantonal Veterinary Office, Switzerland (TG01/15, Approval No. 26247).

2.1. Experimental design

The experiment was conducted between November 2015 and October 2016 at the Agroscope Research Station in Tänikon (Switzerland). In total, 126 Swiss Large White piglets were separated from 21 sows between 3 and 5 days after parturition to be raised in an experimental artificial rearing system. The short period of time the piglets stayed with the mother sow enabled them to ingest sufficient amounts of colostrum.

Data collection was carried out in seven batches. In each batch, 18 piglets were taken from three sows with farrowing dates no more than 4 days apart. Each sow contributed five to seven piglets from her litter. If possible, three male and three female healthy piglets with a weight close to the average litter weight were chosen from a given sow. If a sow did not have enough piglets matching these requirements (7 of 21 sows), additional piglets from the litters of the other sows of the same batch were selected. Piglets were marked individually with numbered and coloured ear tags.

The 18 piglets were allocated to three identical pens of the artificial rearing system. The six piglets in a given pen always consisted of three males and three females. Whenever possible, one male and one female piglet from each of the three sows were used (14 of 21 groups). Otherwise, at least two piglets came from the same sow (20 of 21 groups) or, in a single case, one sow contributed only one and another sow three piglets.

2.2. Artificial rearing system and management

The three pens of the artificial rearing system were lined up next to each other. Each pen measured 0.93 × 1.0 m and was limited by wooden walls of 0.5 m height. In line with the Swiss legal prescriptions, the space allowance per piglet was 0.15 m^2. The pens were divided into a resting and a feeding-dunging area of equal size, separated by a polyvinylchloride strip curtain (Fig. 1). The floor of the resting area was covered with a rubber mat and wood shavings as bedding material which was provided once daily. Further, the resting area was covered by a lid with an integrated heating plate. The feeding-dunging area had a slatted floor (slot width of 9 mm) and was equipped with two milk cups with an inside diameter of 10 cm (Neopigg™ Rescue Care, Provimi B.V., Rotterdam, Netherlands) which were placed at a distance of about 15 cm from the sidewalls (Fig. 1). Piglets were provided with artificial milk (Rescue Milk 2.0, Provimi B.V., Rotterdam, Netherlands) *ad libitum*. The milk was prepared freshly twice a day in a mixing tank and both the tank and the supply tubes to the milk cups were heated to ensure a milk temperature of about 25 °C. Further, water was provided *ad libitum* in a water bowl placed in the corner of the feeding-dunging area.

As the early weaned piglets were not familiar with the milk cups when being separated from the sow, they were trained to drink from the milk cups on the first day after relocation to the artificial rearing system. Therefore, each piglet was placed in front of a milk cup and its snout was moistened with milk. After that, their drinking ability was checked every 2–3 h. If a piglet was not drinking on its own, additional guidance was provided by repeatedly dipping the snout into the milk cup. All piglets drank independently after 24 h at the latest.

Male piglets were castrated under analgesia and isoflurane anaesthesia within the first 10 days of age (between days of behavioural observations). Canine teeth were neither clipped nor grinded and tails were not docked. When a piglet showed signs of diarrhoea, all piglets were treated with a herbal product (Stullmisan® S ad us. vet., Pharma Stulln GmbH, Stulln, Germany) administered into the mixing tank. If the piglets continued to be sick, they were treated with antibiotics by standard veterinary practice.