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Litter competition during nursings and its effect on sow response on Day 2 postpartum

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ABSTRACT

The aim of the present study was to assess neonatal sibling competition during nursing on Day 2 postpartum (pp) as well as its effect on the sow's responses. A total of 41 healthy loose-housed sows and their piglets were directly observed and video recorded for 6 h on Day 2 pp. Piglet behaviours (presence at the udder, fighting, and screaming) were scored in 15 s intervals, commencing 5 intervals (i.e. 75 s) prior to milk ejection and for 9 intervals (i.e. 135 s) after milk ejection. The proportion of piglets which missed the milk ejection, postural changes by the sow, and whether the nursing was with milk ejection were also noted. The mean number of piglets per litter exhibiting fights (FIGHTS), and exhibiting fights with screams (FIGHT-SCRES) was calculated for before (pre-massage) and after milk ejection (post-massage). While the number of piglets with FIGHT-SCRES was higher during pre-massage than during post-massage (0.28 vs. 0.18 piglets, $P < 0.01$); the number of piglets with FIGHTS did not differ between pre- and post-massage (1.28 vs. 1.19 piglets). A higher number of piglets with FIGHTS ($P < 0.0001$) and FIGHT-SCRES ($P < 0.0001$) were associated with a higher proportion of piglets missing a milk ejection. There were no significant effects of the number of piglets with FIGHTS or FIGHT-SCRES detected on the probability of non-nutritive nursings or sow posture changes during pre-massage. However, a higher number of piglets with FIGHT-SCRES increased the probability of a sow terminating post-massage with posture changes ($P < 0.05$). In conclusion, low piglet competition on Day 2 pp, and the threshold level of 1–2 piglets involved in neonatal litter competition appears to be too low to prevent milk ejection, although sows changed posture after milk ejection due to piglet competition with vocalizations.

1. Introduction

During the neonatal period, there is strong sibling competition, during which piglets will fight for access to the sow's teats in order to establish a teat order (de Passillé and Rushen, 1989; Puppe and Tuchscherer, 2000; D'Eath and Lawrence, 2004). Sibling competition in pigs has been described both as a rigid dominance order, where the individuals share resources according to their rank order (e.g. Hemsworth et al., 1976; de Passillé and Rushen, 1989), and as a "begging scramble" where offspring gain resources, according to their relative levels of begging (Macnair and Parker, 1979; Parker et al., 1989). The most intense competition occurs shortly after birth, where an individual piglet can sample about 7–8 teats (de Passillé et al., 1988; de Passillé and Rushen, 1989). Such behaviour helps to ensure teat access when milk ejection occurs, which is only at specific intervals which start approximately 12 hpp (every

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hour for 20 s). Recently, it has been shown that only less than 50% of the teats were accessible during the important colostrum period, and that this is a major challenge for the piglets in getting teat access (Vasdal and Andersen, 2012), as early colostrum intake is a well-known factor for piglet survival (Tuchscherer et al., 2000). Loud screaming is common during competition at the udder (Algers and Jensen, 1985; Newberry and Wood-Gush, 1985; Puppe and Tuchscherer, 2000; Illmann et al., 2008), and it has been suggested that screaming is a signal from the piglets to the sow that they are excluded from teat access, and consequently from any subsequent milk ejection (Appleby et al., 1999). There is some evidence that piglets continue fighting even after milk ejection during the first few days pp (Milligan et al., 2001). It has been suggested that this may increase the chances of future teat access for those piglets yet without the consistent usage of one teat (Milligan et al., 2001). Almost 90% of piglets suckled from a preferred teat on Day 4 pp (Puppe and Tuchscherer, 1999; Milligan et al., 2001). Neonatal litter competition (e.g. fights and screams) should occur before this time. However, the levels of fighting and screaming at teat access during neonatal litter competition, before and after milk ejection, as well as its effect on the sows' responses are almost unknown.

To understand the function and consequences of neonatal litter competition, it is necessary to investigate the typical nursing pattern exhibited by the domestic sow during the entire nursing period. Each nursing bout comprises an intensive pre-massage phase (i.e. udder massage before milk ejection) lasting from 1 to 3 min, followed by a 20 s milk-ejection phase, during which the piglets ingest milk, and finally a post-massage phase (i.e. udder massage after milk ejection) of up to 10 min (e.g. Illmann and Madlafousek, 1995; Jensen et al., 1998). The functions of the pre-massage phase include the massaging of the udder by the piglets in order to induce the release of oxytocin (Fraser, 1973; Ellendorff et al., 1982), synchronization of the litter prior to milk ejection, and to allow all of the piglets to gain access to a functional teat (de Passillé and Rushen, 1989). Additionally, the post-massage phase has been suggested to stimulate future milk production of the teat receiving the massage, and the scent marking of the teats (Algers and Jensen, 1991; Špinka and Algers, 1995; Jensen et al., 1998). A similar pattern of nursing behaviour has been also observed in several other mammalian species, such as common hippos (*Hippopotamus amphibius*; Pluháček and Bartošová, 2011) and dolphins (*Stenella frontalis*, *Tursiops truncatus*; Peddemors et al., 1992; Miles and Herzing, 2003).

The typical nursing pattern with the sow's grunting vocalizations, as well as the initial and final massage is fully developed after the first day pp (Fraser, 1980). Before this time it is difficult to judge whether there was milk ejection or not (Illmann et al., 2008).

The 20 second-long milk ejection is the only time when the piglets obtain milk. As it is essential for piglet survival to immediately gain milk, it is predicted that there will be a higher number of piglets involved in fights and screams during pre-massage than after milk ejection (i.e. during the post-massage period). It has already been shown by Appleby et al. (1999) that a piglet temporarily deprived from milk (at 10–18 days pp) by covering the sows teats vocalized more during the intervals before milk ejection than after. It has also been shown that in larger litters more piglets miss the milk ejection during early lactation (Milligan et al., 2001; Andersen et al., 2011). However, it is unknown whether the number of piglets fighting and screaming before milk ejection are indicators of the proportion of piglets which will actually miss milk ejection. Access to a functional teat is extremely important for piglet survival, which suggests that piglets may fight and scream after milk ejection, even when there is no milk immediately available.

Sibling competition in pigs is likely to be a mechanism to reduce the number of surviving offspring, thus ensuring that the amount of resources available for the survivors increases, and therefore their likelihood of survival (e.g. Drummond et al., 2000; Legge, 2002; Andersen et al., 2011). However, there will also be a cost to the sow because resources have been used by offspring that do not survive, while resources are expended to those offspring most likely to survive in order to prevail in the competition, and aggressive competition for access to teats may cause discomfort for the sow if the teats are injured.

Since sibling competition is essentially beneficial for the sow, to ensure the survival of high quality offspring, it is predicted that the sow will show low responsiveness to fighting and screaming piglets at the udder shortly after birth. However, when litter competition with vocalization reaches a certain level, it might indicate that more piglets have no teat access, and the sow will terminate the nursing (either by changing posture and/or preventing milk-ejection) in order to suppress increased litter competition (Vieuille et al., 2003; Illmann et al., 2008).

A high sow response, including posture changes and non-nutritive nursings (NNNs), may negatively influence piglet survival. NNNs decrease the interval between successive nursings, and lower the milk intake over time (Špinka et al., 1997, 2011). Furthermore, sow posture changes confer a high risk of piglet injury during the first 3 days pp (Wechsler and Hegglin, 1997). Specifically, a sow rolling from a lateral to a ventral position is known to increase the likelihood of piglet crushing (Marchant et al., 2000; Weary et al., 1996, 1998).

The aim of the present study was to assess sow responses to sibling competition during nursing on Day 2 pp, the time when the suckling pattern is fully developed, yet the teat order has not been established. It is predicted that the number of fighting piglets with screaming during nursing would be higher during pre-massage than after milk ejection (i.e. post-massage) due to the immediate milk ejection. Furthermore, it is predicted that the higher number of fighting and screaming piglets during pre-massage would suggest a higher proportion of the piglets missing the milk ejection. Finally, it is predicted that the likelihood of the sow terminating the nursing, either by a NNN or postural changes, would depend on the number of fighting piglets, even more so on the number of screaming piglets during nursing.