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The effect of ketoprofen on post-partum behaviour in sows

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ABSTRACT

A randomized, double-blinded, placebo controlled trial was conducted in order to estimate pain-related behavioural changes of sows in early lactation. Ketoprofen (KET) was used (3 mg/kg BW) intramuscularly for three consecutive days *post-partum* (p.p.) on 19 sows. Nineteen sows were used as a control group and they received sodium chloride as placebo (PLAC). All 38 sows were videotaped for 3 days p.p., in total of 6 h a day for behavioural analysis. Percentages, bout lengths and numbers of occasions were calculated from four different body postures (standing, lateral and sternal lying and lying udder towards piglet area, UTP) and active head movements. Numbers of all nursings and percentages of unsuccessful and sow terminated nursings were calculated. Feeding and drinking were observed as numbers of occasions. Differences between treatments (KET and PLAC) and parities (young, parity 2–3 and old, parity 4–9) were analyzed with repeated measures mixed models. No treatment effect was detected on any measured parameter. Interactions between treatment and parity were found for position changes, standing, feeding, drinking and UTP ($P < 0.05$ for all). Young KET sows presented more position changes than young PLAC sows (29.3 ± 3.0 vs. 20.1 ± 3.0, $P = 0.04$) and more standing bouts than old KET ones (2.6 ± 0.4 vs. 0.9 ± 0.4, $P = 0.03$). Young KET sows had more UTP bouts than PLAC peers (4.1 ± 0.4 vs. 2.3 ± 0.4, $P = 0.05$). Old KET sows drunk less often than PLAC peers (0.6 ± 0.3 vs. 1.5 ± 0.3, $P < 0.01$) but young KET sows ate more often than old KET sows (2.3 ± 0.4 vs. 1.0 ± 0.3, $P = 0.01$). Young sows in general appeared more active and they were changing position more frequently than old KET sows. In conclusion, lying passively may be one of the signs of pain after farrowing in young sows and when treated with ketoprofen, they exhibit increase of movement.

1. Introduction

Farrowing is intrinsically a painful process, but very little is known about pain that sows might experience post-farrowing. Before farrowing sow behaviour is characterized by increased activity (Jarvis et al., 2001) and the onset of lactation turns her rapidly into lateral lying that appears as passive behaviour (Oliviero et al., 2008; Wallenbeck et al., 2008; Malmkvist et al., 2012). *Post-partum* (p.p.) sows

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are at high risk for painful conditions. Increased lying p.p. predisposes sows to skin lesions due to roughness of the flooring material (Norring et al., 2007). In our previous study, we found that sows treated with ketoprofen developed skin ulcers later during lactation than the control sows (Viitasaari et al., 2013) which may be due to reduced lying. A decrease in lateral lying behaviour reduces the possibilities for piglets to manipulate the udder. Injuries and pain in the udder caused by piglets during nursing are common (Gallois et al., 2005) and may cause interrupted sucklings leading to insufficient emptying of udder (Rutherford et al., 2011). However, the association between pain and problems in lactation are not well understood in sows. In addition, especially old sows may suffer from chronic pain due to multifactorial conditions (Baer and Bilkei, 2005).

Lying behaviour and position changes have been related to be part of a pain response in sows. Administration of the nonsteroidal anti-inflammatory drug (NSAID) meloxicam p.p. has been shown to reduce sows' total lying duration (Mainau et al., 2012). Endogenous opioids increase pain threshold during farrowing in sows and thus act as analgesics even for up to 7 days of lactation (Jarvis et al., 1997). Sows receiving naloxone (an opioid antagonist) spent less time lying laterally and more time lying sternally than controls. Naloxone also triggered more frequent posture changes after farrowing which decreased after a few days to the level of controls (Jarvis et al., 1999). Frequent postural changes are also linked to high maternal defensiveness (Baxter et al., 2011): savaging gilts, for example, change postures more often during the puerperium than non-savaging gilts, and this has been suggested to be part of a more complex behaviour relating to pain (Chen et al., 2008). Parity is an important factor when assessing *post-partum* pain as parity seem to affect the maternal behaviour of sows (Vangen et al., 2005).

Another typical behavioural change in relation to painful conditions, is a change in feeding behaviour. A reduction in feeding behaviour has been shown to be a response to malaise (Weary et al., 2008) and does not occur during treatment with ketoprofen p.p. in sows (Viitasaari et al., 2013). Appetite and thus eating maintains gut movement and therefore sows also had shorter period of constipation during p.p. ketoprofen treatment (Viitasaari et al., 2013). Constipation is common in p.p sows, and can cause pain and reduced production performance (Oliviero et al., 2009).

Our objective was to analyze changes in the behaviour of p.p. sows of different parity after the administration of the non-steroidal anti-inflammatory (NSAID) drug, ketoprofen. We hypothesized that sows receiving pain alleviation respond to the treatment by changes in general activity and improving nursing behaviour.

2. Materials and methods

The experimental procedures were approved by the National Animal Experiment Board (ESAVI-2010-09747/Ym-23, PH22A) and the Finnish Medicines Agency (FIMEA, Vetkl-nro 03/10).

2.1. Animals and housing

We performed a double blinded, placebo-controlled field trial with a total of 38 clinically healthy Norwegian landrace-Yorkshire hybrid sows with parity ranging from 2 to 9 in a commercial piglet producing farm in Western Finland. The sows were moved from group-housing to farrowing crates (225 cm × 72 cm) approximately 7 days prior to expected farrowing. The crates had fully slatted floors with a heat plate and a heat lamp for the piglets on either side of the sow. Each sow received a handful of fresh straw every day. Lactating sows were given commercial liquid feed five times daily, with an initial energy content of 17.6 MJ on day 1, and increasing up to 128.0 MJ by the day 18 of lactation. Water was available ad libitum from a water nipple.

Progress of farrowing of the sows were monitored during piggery working hours (from 06:00 to 15:00) and assisted if necessary. After all piglets of each sow were considered to be born and placenta expulsed, piglets were isolated from their mother with a low fence for approximately 1.5 h and the sow received an injection of 7–10 IU of oxytocin to improve colostrum excretion. Cross fostering was initiated during the first day of their life by merging equal sized piglets into one litter. The caretakers checked each sow for all signs of disease, especially for mammary oedema, vulvar discharge and leg problems, daily from farrowing to weaning.

2.2. Medication

Sows were randomly allocated into two treatment groups in blocks of 8 within farrowing room. Nineteen sows received ketoprofen (KET) (Ketovet 100 mg/mL, Richter Pharma AGFeldgasse 19A-4600 Wels) intramuscularly 3 mg/kg and nineteen received equal volume of isotonic saline as placebo (PLAC). Treatments took place during the first 1.5 h after farrowing or latest at 6 am and thereafter once a day for two consecutive days. Recordings started each day after treatment.

2.3. Behaviour observations

A videocamera (Foscam FI8904W, Foscam Electronics, HK) was installed above each pen one to 2 days before the expected farrowing. Data were recorded with two frames a second and was stored to a hard drive (Blue Iris v.2.64, Perspective Software Corp.). Videos were analyzed using CowLog software (Hänninen and Pastell, 2009). Videos were observed daily from day one until day 3 p.p. Video observations lasted for 6 h per day in two 3-h observation windows starting 12 h after first piglet was born (Fig. 1).

Head and body postures, eating and nursing behaviours of the sows were recorded continuously from the videos. Detailed behavioural definitions are explained in Table 1.

3. Statistics

The sows were divided into parity 2–3 (young, $n = 17$) or 4–9 (old, $n = 21$). From the behaviour data frequencies for all observed behaviours were calculated. Lying udder