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Drinking behaviour in sows kept outdoors during the winter months

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ABSTRACT

In the light of the EU regulation, "pigs must have permanent access to a sufficient quantity of fresh water" and the practical problems it provides farmers during winter to keep water free of ice, the aim of this study was to investigate the influence of periods with frost on the diurnal pattern of water intake in sows kept outdoors with free access to water. The study was performed on an organic pig herd with outdoor sows. Twenty-four Danish Landrace × Yorkshire sows of different parity (mean: 4.5 ± 2.8) housed in individual farrowing paddocks with free access to water provided by a frost-proof drinking bowl were used. The individual sow's water intake from the drinking bowl was measured continuously from six days before farrowing until weaning at seven weeks after farrowing. Temperature of supplied water to each drinking bowl, air temperature and rainfall was measured continuously. Numbers of born alive, stillborn and weaned piglets were recorded. The recording period was divided into two temperature categories; control days (CD) with daily average air temperature at or above 0 °C and frosty days (FD) with daily average air temperature below 0 °C. The FD included data from 22 days representing 11 sows, while the remaining observations were defined as CD. Average water uptake from six days before farrowing until four weeks after farrowing was higher on FD than CD (28.9 ± 0.8 vs. 23.1 ± 1.8 l/day, $P < 0.001$). Across periods, a clear circadian rhythm was found with 70–75% of the water intake taking place between 8.00 and 20.00 h. The extra water uptake on FD compared to CD was recorded between 8.00 and 16.00 h ($P < 0.05$). Water intake did not differ at night in the period from 20.00 to 8.00 h (6.42 l vs. 6.44 l, respectively for FD and CD). There was no difference between FD and CD in number of visits to the drinking bowl during night (2.1 ± 0.56 and 1.9 ± 0.24 visits/night for FD and CD, respectively). We found higher water intake during frosty days and no difference in water consumption at night between days of frosty and normal weather, which indicates that pigs are motivated to drink even when the weather is cold. However, many farms may not have frost-proof water dispensers, and ice formation could prevent pigs from drinking at night. Thus further work is needed to investigate if sows, during the day, are able to compensate for a lack of uptake of water at night in case of a frozen water resource.

1. Introduction

EU's minimum standard for protection of pigs states "All pigs over two weeks of age must have permanent access to a sufficient quantity of fresh water" (EU Commission, 2001). However, compliance with this requirement has

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caused practical problems during the winter for producers that keep pigs outdoors, since in cold periods, it can be difficult to keep water free of ice especially during the night. Studies of indoor growing pigs' drinking behaviour have shown a diurnal drinking pattern with main water intake during daytime but also some water intake during night (Andersen et al., 2014; Madsen & Kristensen, 2005). The same pattern has been found in indoor gestation sows (Madec et al., 1986). To our knowledge, no studies of water consumption and diurnal drinking behaviour of outdoor pigs have been made.

The reported daily water consumption of lactating sows housed indoors ranges from around 14 l (Fraser and Phillips, 1989; Seynaeve et al., 1996) up to 27 l (Kruse et al., 2011; Quiniou et al., 2000), with a large variation between individual animals (Kruse et al., 2011; Seynaeve et al., 1996). The water consumption can be influenced by different factors such as feed composition (Oliviero et al., 2009; Seynaeve et al., 1996), amount of feed intake (Kruse et al., 2011), drinking water temperature (Jeon et al., 2006) and litter size (Seynaeve et al., 1996). Lactating sows gradually increase their intake of water the first 4 (Fraser and Phillips, 1989) to 16 days after farrowing, after which it remains on a stable level during lactation (Kruse et al., 2011; Seynaeve et al., 1996). During the same period, milk production also increases gradually until it reaches a stable level two weeks after farrowing where it remains until weaning at four weeks (King et al., 1997). Water is the major component of milk (Klobasa et al., 1987), and a positive correlation between sows' water intake and their piglets' weight gain has been found (Fraser and Phillips, 1989; Kruse et al., 2011). An increased water and feed intake decreases sows' relative body weight loss during lactation, which has a positive effect on subsequent reproduction (Kruse et al., 2011). In addition, a low water intake is related to urinary tract disorders (Madec et al., 1986). Adequate water intake is therefore important for both the sow's and piglets' welfare.

In indoor production systems, the water resource is generally close to the animal, whereas sows housed outdoors usually have longer distance to the water resource. De Oliveira Júnior et al. (2011) found that sows housed in semi-outdoor farrowing pens visited the water resource fewer times, but spent more time drinking, than sows in conventional farrowing pens. A possible theory for this is that as outdoor sows have longer distance to water resources they prioritise to drink larger quantities at a time. Johnson et al. (2001), however, found that indoor-housed sows spent a higher percentage of their time drinking than sows housed outdoor, possibly due to the fact that part of the water activity, seen in indoor-housed sows, is redirecting oral behaviour towards the water nipple, for example as a result of lack of satiety with regard to nutrition and probably behavioural needs (Terlouw et al., 1991).

Different factors can affect the pigs' diurnal rhythm e.g. feeding time (Mroz et al., 1995) and high ambient temperature (Feddes et al., 1989; Renaudeau et al., 2003). Given the difference between the indoor and outdoor production system (e.g. ambient temperature and housing), it is likely that, as in drinking behaviour, there are also differences in the diurnal drinking pattern between the two production systems. Results from indoor production systems can, therefore, not be applied directly to outdoor production systems.

In the light of the EU regulations, and the practical problems they provide farmers, we see some questions that need addressing: (1) Do outdoor sows drink during night in periods with frost, and what is the water intake during night? (2) If outdoor sows drink during night, how does it affect the sow (behaviourally and physiologically) if it is not able to drink at night (e.g. if the water is frozen)? This study addressed the first question. We tested the hypothesis that in sows housed outdoors, the diurnal pattern of water intake may be influenced by ambient temperature, and that the proportion of water intake during night in periods with average day temperature at or above 0 °C and day with average day temperature below 0 °C may differ. We also tested the hypothesis that the number of visits at the drinking bowl at night may be affected by the ambient temperature. We focused on the lactation period, because this is when water requirement is greatest.

2. Material and methods

2.1. Animals and husbandry

The experiment took place on an organic pig herd in Denmark (latitude N56°, longitude E9°), with sows and piglets kept outdoors. The farm was managed under commercial conditions in accordance with the EU regulations for organic production and the Danish branch agreements for organic pig production (Videncentret for landbrug, 2013). The research was conducted from October 2011 to April 2012 (during winter).

Twenty-four Danish Landrace × Yorkshire sows of different parity (4.5 ± 2.8; mean ± SD) were used, and data were recorded from six days before farrowing to seven weeks after (weaning of litter).

Sows were housed in outdoor groups during gestation. The sows were transferred from the gestation paddocks to individual farrowing paddocks approximately seven days before expected farrowing date. The individual farrowing paddocks were approximately 24 m × 27 m, separated by electric fences. Farrowing occurred in insulated huts. The huts had sloped side walls (53°), a floor area of 4.6 m^2 (2.36 m × 1.96 m) and a height of 1.11 m. The entrance (0.54 × 0.72 m) was covered with two vertical plastic strips. Huts were initially strewn with long-stemmed straw, which was replenished when needed. Between the hours 8.00 and 11.00, all farrowing huts were checked by the farmer, and the sows were fed in a feed trough in the paddock with a diet containing 45% barley, 35% wheat and 20% supplementary feed for organic sows (Natur So T 20 F, DLG, Copenhagen, DK). Sows and piglets were always able to graze and root in the paddock. If necessary and possible, litter equalisation was performed within the first two days after farrowing. Male piglets were castrated two to three days after farrowing. Sow and piglets remained in the individual farrowing paddocks until weaning. Weaning age was seven weeks. After weaning, the hut was moved to a new location in the farrowing paddock, and the paddock was left empty for at least one week before a new sow entered. The entire sow area was surrounded by a