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Early human handling in non-weaned piglets: Effects on behaviour and body weight

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ABSTRACT

Early handling of animals including tactile stimulation (TS) has been shown to have beneficial effects on the physical and psychological development of species where considerable maternal interaction, e.g. in the form of licking, already occurs. But little is known about the magnitude of these effects, if any, in species without this natural mechanism. Piglets from 13 litters ($N = 127$) were subjected to four treatments: AH – all piglets in a litter received TS; NH – none of the piglets in a litter received TS; 50/50H – half of a litter received TS and 50/50NH – half of a litter did not receive TS. The TS was performed by a human stroking the back of the piglet for 2 min from 5 to 35 days of age. At 4 weeks of age the piglets were tested twice in an open-field/human-approach test, with either a familiar (F) or an unfamiliar person (U). Body weight was measured at birth, 5, 9 and 12 weeks of age. In the tests, AH and 50/50H piglets allowed more physical contact, regardless of the familiarity of the person (AH: 22.5 ± 2.3 F; 24.1 ± 2.3 U, 50/50H: 18.1 ± 2.2 F; 25.3 ± 2.2 U, $P = 0.05$). Additionally, AH piglets vocalized least and were least often in the perimeter zone (PZ) of the arena (AH grunts: 6.0 ± 0.8, $P = 0.002$; 12.8 ± 0.8, $P = 0.0005$; 18.1 ± 0.8, $P = 0.08$; AH PZ: 3.9 ± 0.8, $P = 0.009$; 9.1 ± 0.8, $P = 0.003$; 12.6 ± 0.7, $P = 0.004$ in isolation, stationary and moving person phase, respectively). In contrast, NH piglets vocalized most and were most often in the PZ. 50/50NH had higher body weights at 12 weeks than 50/50H, whereas AH and NH piglets were intermediate (AH: 36.9 ± 0.9, NH: 35.6 ± 1.0, 50/50H: 34.2 ± 1.3, 50/50NH: 37.8 ± 1.3, $P = 0.03$). This study suggests that early handling changed the way piglets reacted to challenging situations in that handled piglets showed behaviour suggesting they were less fearful in a novel environment and less fearful of being handled by people in general. Interestingly though, the early handling did not result in the same beneficial effects on the physical development of the piglets, as handled piglets were not heavier. Instead, it was the 50/50NH piglets that were the heaviest, implying that the daily presence of a human moving around in the pen to handle the 50/50H piglets seemed to stimulate weight gain.

1. Introduction

Human handling at an early age, by applying tactile stimulation (TS), is considered an important element influencing the development of young rodents (Fernández-Teruel et al., 2002). It is known in rodents and several

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other species that there is a sensitive period during early postnatal development when environmental manipulations can result in permanent changes in the hypothalamic–pituitary–adrenal (HPA) axis function, behaviour and body weight (Champagne et al., 2009; Weaver et al., 2000). Biologically, it is expected that human handling in early infancy causes small doses of stress in the animals, modifying and accelerating the development of their central nervous system. More specifically, tactile stimulation has been shown to increase the glucocorticoid receptor sites in the hippocampus, changing the responses of the HPA axis of handled rats compared to non-handled animals (Levine, 2005). Such changes seemed to be linked with a greater resistance to pathogens, a higher weight gain and greater efficiency in cognitive ability tests (Levine, 1960, 1957, 1956). According to Kolb et al. (2003), this seemingly benign exposure to challenges in early life enhances motor and cognitive skills in adulthood, due to neurochemical changes in brain function and plasticity.

Lately, researchers have applied tactile stimulation in young farm animals and found that animals showed more docile behaviour and reduced fear towards humans (sheep: Boivin et al., 2000; goats: Boivin and Braastad, 1996; horses: Ligout et al., 2008; rabbits: Verwer et al., 2009), better immune status (sheep: Caroprese et al., 2006) and reduced abomasal lesions (calves: Lensink et al., 2000). However, most work done in this field has been carried out in farm animal species where tactile stimulation is an important part of maternal care. There is less work on the general effects of additional handling in early life on species where there is little, if any, maternal tactile stimulation, e.g. pigs. In relation to pigs' maternal care, for instance, sows do not help their offspring to get out of their foetal membranes, nor lick or assist piglets in their teat-seeking activity, but they do spend time building and keeping the nest in good condition (Jensen, 1988). This is in contrast to rats (Liu et al., 2000), which usually give tactile stimulation to the offspring within the nest, or to ungulates, which are involved in a high number of physical interactions with their offspring. There are clear survival benefits for these altricial and precocial offspring of this physical stimulation by the mother (Nowak et al., 2000). Pigs, on the other hand, are in the middle of these extremes since they have a developed sensorial capacity at birth but an inefficient thermoregulatory mechanism. Such differences and the lack of a natural mechanism related to maternal tactile stimulation might be important for the level of stress that pigs experience when being touched by humans compared to the species already studied.

Reduced fear towards humans is a benefit of early handling, since fear of humans is strongly related to decreases in productivity and poor welfare in all domestic species (Rushen et al., 1999). Some authors argue that the decreased avoidance of humans and increased motivation to interact with people as a result of touching and stroking may also facilitate handling procedures. Some research has been carried out with pigs, evaluating the effects of handling weanling pigs on their fear of humans (Gonyou et al., 1986; Hemsworth et al., 1986; Tanida et al., 1994). Generally, in previous research (Hemsworth and Barnett, 1992; Hemsworth et al., 1986; Tanida et al., 1995), handlers adopt a stationary squat posture and the contact has been at the initiative of the piglets themselves, with a view to making the interaction as positive as possible. However, no studies in pigs have investigated the effects of the type of handling carried out in laboratory animals, where the repeated tactile stimulation is forced and so could probably be considered a mild stressor.

There are several well-established tests to assess exploratory behaviour and fear in pigs and most of these are adapted from laboratory animal studies, e.g. the open field-test. Although not all assumptions of the test within rodent research (i.e. thigmotaxis) can be directly transferred into pig assessments (Murphy et al., 2014), this test has been widely used. According to Forkman et al. (2007), it is not clear if the results really indicate fear due to the lack of correlation with other tests. Nevertheless, Donald et al. (2011) proposed that the open-field test can be used to assess emotional states in pigs when combined with other behavioural measurements, e.g. vocalization. The human-approach test assesses fear of humans, offering also the possibility to measure the social relationship with humans, management quality, as well as identifying individual differences (Waiblinger et al., 2006).

The present study examined whether early human handling using TS would improve piglets' growth and alter their reactions in a standardized fear test. The hypothesis was that enforced and regular early human handling would result in heavier and less fearful piglets than non-handling treatments.

2. Materials and methods

2.1. Animals and management

This study was approved by the Ethical Committee of Animal Experimentation in Uppsala, Sweden, under protocol C117/11.

The experiment was conducted in 2011 at the Swedish Livestock Research Centre, Lövsta, at the Swedish University of Agricultural Sciences, Sweden. A total of 127 crossbred Hampshire × Yorkshire piglets from 13 litters were used, with an average litter size of 9.7 ± 2.5 piglets (mean ± SD). Animals were born in farrowing pens (3.84 m × 2.2 m) with partly slatted concrete floors, provided with straw and a heated creep area (1.35 m × 1.65 m). At birth, piglets were weighed and received an ear tattoo for identification. Litters born at the same time were adjusted by moving piglets between sows to make the sex ratio within each litter as even as possible. Before 4 days of age, they received an iron injection, their teeth were ground and males were castrated. Weaning was carried out at 5 weeks of age by removing the sow from the pen. Water was always available and at the age of 21 days the piglets got ad libitum access to commercial pelleted food. All piglets experienced the same daily routines performed by the facility staff.

2.2. Treatments

Piglet litters were randomly assigned to four treatments, balanced for pen location in the stable and day of birth, as follows: (1) all-handled (AH) – all piglets in a litter