



Behavioral preference for different enrichment objects in a commercial sow herd



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ARTICLE INFO

Article history:

Received 10 February 2016
Received in revised form 4 September 2016
Accepted 6 September 2016
Available online 14 September 2016

Keywords:

Enrichment object
Sow
Group pen
Rope
Rubber
Woodblock

ABSTRACT

Increased public concern about farm animal welfare is driving both legislative initiatives and market forces to change how sows are housed and managed. This study investigated the use and preference for enrichment items at a 5600 sows commercial sow farm in eastern USA. Gestating sows were housed in static, pre-implantation groups of approximately 75 sows per pen and fed via a single electronic sow feeding station. Each pen contained one of three enrichment objects (OBJ): hanging rope, hanging rubber sticks, and a fixed wood block. Behavioral data was collected from 18 pens during the course of this study on days 1, 3, 5 and 14 (DAY) that sows were in the pen, and at specific times on each day (TIME). For daytime activity, data was collected on-site in three 2-h blocks between 0800 and 1000, 1100–1300 and 1400–1600 for each pen and for nighttime data was collected on Day 1 in three 1-h blocks between 2200 and 2300, 0000–0100 and 0200–0300. Behaviors recorded included proportion of observation time animals interacted with the object, proportion of animals in pen that interacted with the object, and posture (up/down) of each animal in the pen. Lesion scores were recorded prior to mixing and two weeks post-mixing as a proxy for social aggression. The median proportion of observation time that the sows were in contact with the rope (62.4%) was significantly greater than ($P < 0.01$) the median proportion observed in the rubber pens (31.5%) and significantly greater than ($P < 0.01$) the median proportion observed in the woodblock pens (24.3%). Mixed design ANOVAs indicated a significant interaction of OBJ and DAY ($P < 0.01$) and OBJ and TIME ($P < 0.01$) on the proportion of observation time that the sows were in contact with the enrichment objects. Post-hoc analyses using Bonferroni correction showed that on each observation day and time period, the proportion of observation time that the sows were in contact with the enrichment was significantly greater ($P < 0.01$) in rope pens than rubber or woodblock pens. These results indicate that sows can exhibit clear preferences for enrichment type, with the sows interacting with the rope significantly more often throughout the study, at each sampling hour. However, there were no significant differences in lesion severity or sow activity between the three enrichment types, suggesting that common behavioral patterns including the establishment of social hierarchy took precedence over the pursuit of available enrichment. Additional studies are needed to understand how preferences for enrichment objects could be utilized to potentially impact sow productivity and welfare.

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1. Introduction

Due to both legislative and market driven initiatives swine farmers have been asked to transition their animals from individual gestation stalls to group pens (EU Council Directive 2001/88/EC; Schulz and Tonsor, 2015). The maintenance of gestating gilts and

sows in pens can be difficult due to the multifaceted considerations of pen size, group composition, feeding system, and individual health care and nutrition (Bench et al., 2013a,b). In addition, group housing of gestating gilts and sows may result in increased fighting while the hierarchy is established, and can thus lead to minor or serious injuries (Anil et al., 2005; Hodgkiss et al., 1998). Previous research has found that the provision of enrichment to group housed pigs and sows can decrease both aggression toward pen mates (Beattie et al., 1995; Fraser et al., 1991; Petersen et al., 1995) and stereotypic behaviors (Fraser, 1975; Spooler et al., 1995). The

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goal of enrichment is to enhance the quality of captive animal care by providing biologically relevant environmental stimuli to allow an animal to perform highly-motivated, species-specific behaviors (Mench, 1998; Newberry, 1995). Due to their omnivorous diet, swine have an instinct to dig up and gnaw on objects in their environment to test for edibility (Studnitz et al., 2007). For that reason, research on environmental enrichment for swine has focused on their preference for biologically relevant materials such as straw, mushroom compost, peat and wood shavings (Beattie et al., 1998; Pedersen et al., 2005).

The European Commission adopted a directive in 2001 which states that swine farmers must provide all animals with enrichment “to enable proper investigation and manipulation activities”, and highlights that both dry and pregnant sows and gilts must be “given a sufficient quantity of bulky or high-fibre food. . .in order to satisfy their hunger and given the need to chew” (EU Council Directive 2001/93/EC, Council Directive 2001/88/EC). Conversely, swine farmers from the other top pork producing countries, the US, China, and Brazil, are not required by federal law to provide environmental enrichment for their animals (Mench, 2008; Von Keyserlingk and Hötzel, 2015). The provision of rooting materials is not common on US swine farms due to the risk of such materials clogging commonly used liquid based manure handling systems (Westin et al., 2013) as well as biosecurity concerns and the potential increased labor costs associated with handling a substrate like straw. Swine farmers in the US may provide these materials for market driven reasons if they are required to adhere to animal welfare standards of various certification programs including the Animal Welfare Institute (AWI), Humane Farm Animal Care (HFAC), American Humane Association (AHA), and the Global Animal Partnership (GAP). The requirement for enrichment in these programs is varied, with some specifying materials that allow rooting, pawing and chewing behaviors while others only require the provision of objects (such as balls, rope, etc.).

While there have been numerous reports on the type of enrichment sufficient for enabling exploratory behaviors in grow/finish piglets (Scott et al., 2006; Van de Weerd et al., 2006; Jensen and Pedersen, 2007), it is not clear which enrichment items, or which item properties, are appropriate for group housed adult swine. Since gestating gilts and sows are fed a restricted diet, their motivation to interact with enrichment could be different from that of growing pigs which are usually satiated due to ad lib feeding (Lawrence and Illius, 1989; Day et al., 1996). In addition in the absence of federal regulations, the farmers’ choice of enrichment will most likely be based on economical and practical considerations rather than on the behavioral needs of the animals.

To better understand the enrichment preferences of group housed gestating gilts and sows, and the impact of such enrichment on behavior, we investigated the use of three enrichment objects (hanging rope, hanging rubber sticks, and fixed wood block) on gilts and sows housed in gestation pens following group constitution. Given the preference of swine for destructible materials, we hypothesize that interaction with the rope enrichment will be greater than the interaction with the rubber or woodblock enrichment.

2. Materials and methods

2.1. Animals and housing

This study was conducted at a 5600 sows commercial sow farm in Northeastern Pennsylvania. The gestating gilts and sows (Choice Genetics L3, West Des Moines, IA, USA) were housed in static pens (1.85 sq m/sow) with 100% slatted flooring, and fed an industry-standard corn-soybean diet based on their body condition score

Table 1

Behavior events and postures recorded in treatment pens (~75 sows/pen) with hanging rope strands, hanging rubber sticks, or fixed woodblock enrichment.

Behavior	Operational Definition
Object contact	Animal makes physical contact (mouth, nose, body) with enrichment.
Stand	Body weight supported by all four legs. Animal remains motionless.
Walk	Body weight supported by all four legs. Animal may be moving forward at a fast or slow pace.
Sit	Body weight supported by front legs and hindquarters.
Lying down	Body weight supported by side or belly.

and gestational state via a single electronic sow feeding station per pen (Schauer Agrotrotron Compident 7, Prambachkirchen, Austria). The feeding stations were open from midnight to 2000 every day. Every week two treatment pens were initiated. Pens were constituted by moving approximately 75 recently bred animals from individual breeding stalls and mixing them together in a single static gestation pen three to five days after insemination. Each pen was monitored immediately after mixing (Day 1), as well as 3, 5 and 14 days post-mixing. There were six replicates for each enrichment treatment resulting in a total of 18 pens and 1350 sows (450 sows per treatment) monitored throughout the study. All data was collected during live observations of pen. The farm had a current Pork Quality Assurance Plus certification, the guidelines of which directed animal care.

2.2. Experimental design and treatments

The treatments per pen were as follows; one blue BiteRite™ holder (Farmer Boy AG, Myerstown, PA, USA) with four 22.8 × 3.8 cm rubber chew sticks (Fig. 1a), one blue BiteRite™ holder with four strands of 61 × 1.6 cm cotton rope (Troyer’s Rope Co., Conneautville, PA, USA) (Fig. 1b), and one 89 × 89 mm untreated yellow pine woodblock with 15.2 cm of the wood exposed and the remaining portion covered with plastic covering (Fig. 1c). For the rubber and rope enrichment, the holders were attached to the ceiling of the barn and animals had 360° access. The holder for the woodblock was attached to the fence line of the pen and provided 180° of access from within a pen. The rope was replaced in the holder on an as needed basis depending upon how fast sows chewed it up.

2.3. Data collection

2.3.1. Behavioral measurements

Behavioral data on pen activity was collected for 9 h when the static pens were constituted (Day 1), and for 6 h on 3, 5 and 14 days post-mixing. Data collection was split into three 2-h sections: 0800–1000, 1100–1300, and 1400–1600. On Day 1, additional data was collected at night from 2200 to 2300, 0000–0100, and 0200–0300. During each sampling block, a scan sample of the number of animals interacting with the enrichment object was recorded every three minutes. Every 10 min, the number of animals standing/walking or sitting/lying down was recorded (see Table 1 for operational definitions of behaviors). Prior to data collection, inter-observer agreement was established among the three observers (Cohen’s kappa ≥ 0.8) for the number of sows in contact with object and the number of sows standing or walking at the sampling point. Due to scheduling error, data from two woodblock pens were not collected on Day 5.

2.3.2. Lesion scoring

Previous research on aggressive behavior among pigs suggests that lesion scores, especially of the anterior region, could identify

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