

Neonatal Piglet Interaction with Environmental Enrichment Ropes

DOI:10.31274/air.13988

Phoebe Hartoonian, Undergraduate Research Assistant, Department of Animal Science, Iowa State University
Emiline Sundman, Graduate Research Assistant, Department of Animal Science, Iowa State University
Nicholas Gabler, Professor, Department of Animal Science, Iowa State University
Kenneth Stalder, Professor, Department of Animal Science, Iowa State University
Anna Johnson, Professor, Department of Animal Science, Iowa State University
Locke Karriker, Professor, Swine Medicine Education Center, and Veterinary Diagnostic and Production Animal Medicine, Iowa State University
Suzanne Millman, Professor, Veterinary Diagnostic and Production Animal Medicine, and Biomedical Sciences, Iowa State University

Summary and Implications

The objective of this study was to determine if neonatal piglets would interact with environmental enrichment ropes, drawing them away from the sow. A total of 84 piglets from 9 sows were housed in farrowing stalls. Litters were provided with environmental enrichment ropes hung at piglet eye level above a heat mat on Day 2 to Day 5 after farrowing. Litters were assigned to one of three rope treatments: 1) sunflower oil (OIL), 2) semiochemical (SC) and 3) milky cheese (MC). Overall, 75% (63/84) of the piglets interacted with the ropes. Piglets preferred the plain OIL treatment compared to both the MC and SC treatments, as indicated by a greater total percent of pigs interacting with the OIL ropes. Overall, this study determined that piglets did interact with environmental enrichment ropes, which drew them away from the sow. At this early stage of life, a piglet's main motivators are sow-directed, so an environmental enrichment tool that draws piglets away from the sow to reduce the possibility of becoming crushed is a significant finding.

Introduction

Pre-weaning mortality represents a significant economic loss within the swine industry and is a swine welfare issue. A major contributor to pre-weaning mortality is piglet crushing by the sow. Environmental enrichment (EE), defined as the "improvement in the functioning of captive animals resulting from modifications to their environment" (Newberry, 1995), has the potential to decrease crushing. Piglets display cyclic behavior of eating and resting in warm locations, i.e. close to the sow. Given piglets' strong olfactory senses, we hypothesized that milky cheese and semiochemical scents and opportunity for oral manipulation of ropes would entice piglets away from the sow between suckling events. Therefore, the objective of this experiment was to determine if neonatal piglets would

interact with environmental enrichment ropes away from the sow.

Materials and Methods

All experimental procedures were approved by the Iowa State University Animal Care and Use Committee (IACUC-20-054). The trial was completed in July and August 2020, and was conducted at the Iowa State University Allen E. Christian Swine Teaching Farm.

Animals and Housing: A total of 84 piglets from 9 sows (7 Commercial Crossbred, 2 Duroc) with an average parity of 3 (range 1-5) were housed in farrowing stalls. The stall area was 2.0 m long x 1.8 m wide, made of slatted plastic flooring. The heating source was a Baby Pig Heat Mat - Single 48 (34 cm W x 122 cm L with a heating area of 0.4 m², polyethylene; Kane Manufacturing, Pleasant Hill, IA). Temperature was set at 32 °C. Sows were provided *ad libitum* access to water and were hand-fed to appetite post-farrowing. Farm staff performed sow and litter observations at 07:00 h and 15:00 h daily, and at regular intervals during active farrowing. Piglets were processed at 1 day of age and individually marked on their backs using livestock-safe paint for identification.

Enrichment device: The enrichment consisted of a PVC pipe with up to seven ropes attached to numbered hooks. The environmental enrichment ropes were placed on the divider between farrowing stalls, so that the ropes hung over the heat mat at piglet eye level. The environmental enrichment ropes were plain cotton, three stranded with a 0.5 cm diameter. The ropes were 33.0 cm long with the last 2.5 cm of rope frayed (Figure 1).



Figure 1. Enrichment device in farrowing stall.

Treatments and Application: The litter was considered the experimental unit. Litters were randomly assigned one of three treatments: 1) sunflower oil (**OIL**, N=3), 2) semiochemical (**SC**, N=3), or 3) milky cheese (**MC**, N=3). Environmental enrichment rope treatments started on Day 2 (48 h after farrowing began) and were replaced every 24 h. The environmental enrichment ropes were removed at the end of Day 5. One rope per two piglet ratio was maintained between and across litters to provide piglets with standardized access to the ropes. The environmental enrichment ropes were placed over the heat mat in each stall.

Behavior recording: Color video was recorded continuously from Days 2 to 5 using Sony HD Handycam cameras mounted above the farrowing stalls. Cameras were inspected and reset every 12 hours, and secure digital (SD) cards were switched out every 48 hours.

Behavior observations: Before training and analysis, all video clips were blinded so only stall numbers remained. Observers were trained to identify frequency (number) and duration (seconds) of rope interactions by each pig, defined as purposeful snout contact with the rope with the mouth open or closed. One researcher with 2 years of behavioral research experience (Sundman) was responsible for training the observers. Observer reliability was calculated using an index of concordance, as a proportion of all agreements (A) and disagreements (D) in behavioral occurrences between observer and trainer, with the formula $(A / [A+D]) * 100 \geq 85\%$. Once the observers reached $\geq 85\%$ reliability agreement with the trainer, data collection began using blinded videos. Behavior was collected using a continuous observation sampling protocol of all piglets in the litter during the light hours (07:00-22:00 hours) of Day 2.

Statistical analysis: Data was sorted by sow and treatment and checked for accuracy using excel. Average frequency and duration (mean \pm SD) of rope interactions were calculated both by treatment and over all treatments. Results will be presented descriptively for Day 2.

Results and Discussion

Regardless of treatment, 63 piglets out of a total of 84 piglets (75%) interacted with the environmental enrichment rope at least once on Day 2. Average frequency of environmental enrichment rope interactions, regardless of treatment, was 4 rope interactions, with an average duration of 8 seconds.

By treatment, frequency and duration of environmental enrichment rope were slightly greater for the piglets assigned to the OIL treatment, although there were large standard deviations (Frequency- Figure 2a; Duration- Figure 2b).

All the piglets assigned the OIL treatment interacted with the environmental enrichment rope at least once (Table 1). It is interesting that piglets assigned to the OIL treatment had the most environmental enrichment rope interactions because previous work has indicated that SC is attractive to nursery pigs and MC is attractive to neonatal piglets. Even though neonatal piglets are cyclic in their suckling and heat seeking behaviors, these results indicate that the neonate piglet is attentive to items in its environment and all treatments were successful in enticing the neonatal piglet away from the sow.

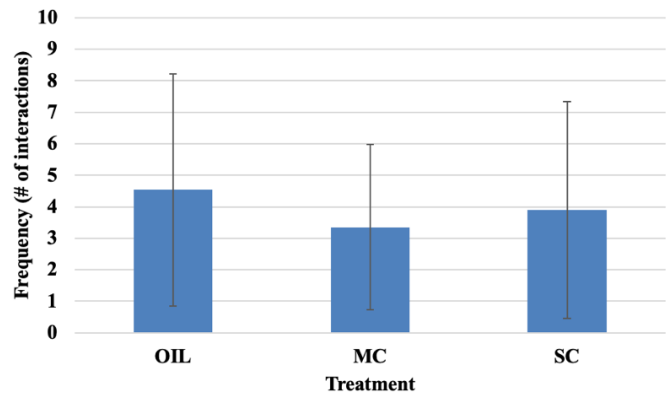


Figure 2a. Average frequency of piglet rope interactions by treatment.

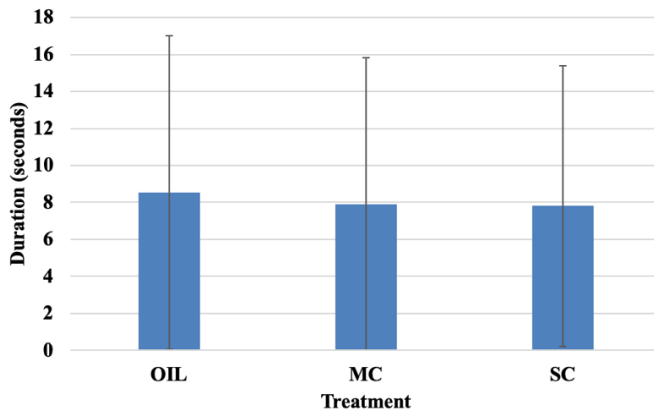


Figure 2b. Average duration of piglet rope interactions by treatment.

Table 1. Number and percent of piglets interacting with enrichment ropes by treatment.

	Treatments			Total
	OIL	MC	SC	
# piglets in treatment	28	24	32	84
# piglets interacted	28	18	17	63
% piglets interacted	100	75	53	75

Conclusions

Overall, this study determined that piglets did interact with environmental enrichment ropes, which drew them away from the sow. At this early stage of life, a piglet's main motivators are sow-directed, so an environmental enrichment tool that draws piglets away from the sow to reduce the possibility of becoming crushed is a significant finding.

Acknowledgements

The authors would like to thank the U.S. Pork Center of Excellence, the National Pork Board, and the Foundation for Food and Agriculture Research Grant #18-147 for their financial support of this project. Partial funding of Drs. Gabler, Johnson, and Stalder's salaries are supported by the Department of Animal Science, College of Agriculture and Life Sciences at Iowa State University, and the U.S. Department of Agriculture