

Date Submitted: 12/12/2008

NCARS/NCCES Code:

Research

REPORT PERIOD 7/1/2007 TO 12/12/2008

PROGRESS REPORT TO:

North Carolina Pork Council

TITLE: Use of audio stimulation to increase suckling piglet growth and survival to weaning

LEADER(S): Joe Cassady and Jack Odle

DEPARTMENT(S): Animal Science

REPORT: Objective: to determine if audio stimulation may be used to increase piglet suckling frequency, resulting in decreased preweaning mortality, increased weaning weights and a greater percentage of high-quality weaned pigs.

Description of Research Project: Audio recordings of sow and piglet vocalizations during suckling were used to impact nursing frequency which we expected to increase sow milk production and piglet growth and survival. According to published reports litter nursing normally occurs at 50-minute intervals. To attempt to increase nursing frequency, we played the audio recording for a 1.5 minute duration at 35-minute intervals. The audio treatment was initiated when the first litter was born in the farrowing room. We equipped two farrowing rooms with audio equipment (36 crates) and two rooms (36 crates) served as controls. Video cameras were used to monitor suckling frequency in each room. In addition to measuring piglet survival and preweaning growth, we measured sow feed intake and lactation weight loss.

Results: The project was done at the NCDA Tidewater Research Station where we farrow four batches of pigs each year with 100 litters per batch in six farrowing rooms. Only four of the farrowing rooms were available for this project. We proposed to do this project during one batch-farrowing season. However, data are now available from two batch-farrowing seasons. The experimental unit for this study is a room. If room were used as the experimental unit we would have only 4 experimental units within each season (8 total). Furthermore, after reviewing the results considerable differences were found among seasons. It was therefore decided that for the purposes of evaluating this preliminary data pig was used as the experimental unit, and seasons were analyzed separately. Obviously, this is not the most conservative approach to analyzing the data, but this approach was deemed most appropriate for determining if further exploration would be prudent.

Season 1 included 63 litters from a Landrace-Large White composite population. Litters were in 4 farrowing rooms. Two rooms were wired with audio and the other two

rooms served as controls (no audio). Average total number born was 10.2 pigs, and average birth weight of the pigs was 1.2 kg. The statistical model included fixed effects of sex, line, and room within treatment (accounts for differences among rooms, but does not test differences among treatments). Total number of pigs born in the litter was included as a fixed regression covariate. This covariate was used to adjust for differences in birth weight that could be attributed to litter size. A random effect of sire within line was also included. A contrast between treatment Least Square Means was used to estimate treatment effects. All traits were effected by sex ($P < 0.05$). Fixed effect of line tended to affect survival to 10 and 21 days of age ($P < 0.10$). Room within treatment affected birthwt, adjusted 10 and 21 day weights, and ADG to 10 and 21 days of age. Total number born affected birth weight ($P < 0.05$), adjusted 10 and 21 day weights ($P < 0.05$), and ADG to 10 and 21 days of age ($P < 0.10$), and tended to affect survival to 10 and 21 days of age ($P < 0.12$). Pigs in the Audio treatment were 167 grams heavier at birth ($P < 0.01$). It is not clear why pigs exposed to the audio would be heavier at birth, but this was observed in both farrowing seasons. Because audio stimulation was initiated when the first litter was born within a room, the remaining litters were exposed in utero. Birth weights are recorded within 24 hours of birth. If pigs in the audio treatment were stimulated to nurse more in the first few hours after birth that might explain differences in "birth weight". Pigs exposed to the audio treatment gained 23.6 grams per day more ($P < 0.01$) from birth to 10 days of age and were 410 grams heavier at 10 days of age ($P < 0.01$). Preweaning survival was low (81.7%) in this population. Pigs exposed to the audio stimulation had 5% greater ($P < 0.35$) survival to 10 days of age than controls. Pig weights at 21 days of age were not different between treatments; however, pigs exposed to the audio stimulation gained 11 grams per day less than controls ($P < 0.08$) from birth to 21 days of age. Survival from birth to 21 days of age was 11% greater ($P < 0.07$) in the audio treatment than controls. Control gilts on average consumed 25 kg more feed ($P < 0.01$) and lost 8.4 kg less weight ($P < 0.18$) during lactation.

Eight video cameras were organized to record suckling activity of 24 litters (12 controls and 12 treated). Video data was sampled to estimate suckling frequency. In order for a section of tape to be considered scoreable at least two bouts of suckling had to be observed. The technician then observed 2 hours of video tape or 5 bouts of suckling whichever came first. Litter was considered the experimental unit for the purpose of analyzing the video data. The average suckling frequency for each litter on each day observed was calculated. This resulted in 456 observations (litter x day). The model used to analyze the data included the dependent variable of "average nursing interval", fixed effect of treatment, random effect of litter nested within treatment, and pig age as a regression covariate. The Kenwood-Rogers method was used to correct the degrees of freedom. The least squares means for suckling frequency in the control and audio treated groups were 35.6 and 33.5 minutes ($P < 0.01$), respectively. The suckling interval was significantly shorter in the group receiving audio stimulation. However, the observed difference of 2 minutes is not likely to be biologically meaningful. What is most concerning is the fact the both groups were nursing at roughly 35 minute intervals which is the interval at which the audio tape was set to loop. According to our review of the literature, pigs nurse on average every 50 minutes. Thus, either our pigs nurse more often than what has been reported in the literature, or the control pigs were also being stimulated by the audio

treatment despite our best efforts to prevent that from occurring. Suitable facilities for testing that theory are not available.

Season 2 included 67 litters from a 4 breed (Landrace-Large White-Hampshire-Duroc) composite population (selected for lean growth). Litters were in 4 farrowing rooms. Two rooms were wired with audio, and the other two rooms served as controls (no audio). Average total number born was 9.5 pigs and average birth weight of the pigs was 1.37 kg. The statistical model included fixed effects of sex and room within treatment (accounts for differences among rooms, but does not test differences among treatments). Total number of pigs born in the litter was included as a fixed regression covariate. This covariate was used to adjust for differences in birth weight that could be attributed to litter size. A random effect of sire was also included. A contrast between treatment Least Square Means was used. Fixed effect of sex ($P < 0.05$) influenced all traits. Fixed effect of room within treatment affected birth weight, adjusted 10 day weight, ADG from birth to 10 days of age, and adjusted 21 day weight ($P < 0.05$). The covariate total number born affected birth weight, adjusted 21 day weight, and ADG from birth to 21 days of age ($P < 0.05$). Pigs in the Audio treatment were 182 grams heavier at birth ($P < 0.01$). As discussed with season 1 it is possible that the audio treatment impacted "birth weight" Pigs exposed to the audio treatment gained 5.7 grams per day more ($P < 0.43$) from birth to 10 days of age and were 244 grams heavier at 10 days of age ($P < 0.01$). Most of this difference can be attributed to the difference in birth weight. Prewearing survival was (90%) in this population. From birth to 21 days of age there were no differences among treatment in growth or survival.

Conclusions: Results from the first farrowing season were encouraging, but there was no response to the audio treatment in the second farrowing season. This could be due to a genotype by treatment interaction. In farrowing season 1 litter size was greater, birth weights were lower, and preweaning survival was lower than in farrowing season 2. Thus, conditions associated with farrowing season 1 may have provided greater opportunity for response to the audio stimulation. Additional data is needed to test this theory. Results of the video raised interesting questions regarding the frequency at which litters nurse. Our observed frequencies were much shorter than those which have been previously reported. It may be useful to observe nursing frequencies in our population in the absence of any treatment to estimate their "normal" suckling frequency. This would help determine if our population naturally has a shorter suckling frequency or if the audio treatment affected the control animals.