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Effects of an Altered Suckling Method on Piglet Performance during Late Lactation and the Nursery Period

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Summary

The effects of an altered suckling method (ALT) on nursery pig performance were studied in a 14-d experiment encompassing late lactation and the early nursery period. A total of 611 pigs (PIC 327 × 1050) nursing 54 sows were used in 2 farrowing groups. Sows were allotted to treatments on d 18 of lactation when all but the 5 lightest-weight pigs from each ALT litter were split-weaned (SW) and moved to the nursery. The lightweight pigs in the ALT litters were paired within parity group such that two litters were combined. These combined litters rotationally suckled (RS) each sow of the pair for 12 h/d from d 18 until weaning on d 25. Pigs in control litters were weaned on d 21. At weaning, pigs were randomly assigned to pens (7 pigs/pen). All weaned pigs received a common feed budget of 4 lb of Phase 1 followed by a Phase 2 diet. Pigs were weighed on d 18, 21, 25, 28, and 32 of age. Differences in weight gain, variation in growth within litter, and the association between piglet weight category on d 18 and treatment effects were evaluated. An interaction was detected ($P < 0.01$) for pig weights and weight gain from d 18 to 32 because the RS pigs gained 15% more than lightweight controls, whereas SW pigs were 15% lighter than heavyweight controls on d 32. Overall variation as measured by the changes in CV and SD was 50% less ($P < 0.01$) within ALT litters compared with controls. When pig weight groups were compared, the ALT treatment benefited ($P < 0.001$) growth of light (<10 lb) pigs but decreased ($P < 0.01$) the weight gain of heavy (>14 lb) pigs. Overall, performance was similar between ALT and control pigs, but the apparent improvement in weight variation observed within ALT litters warrants additional investigation.

Key words: intermittent suckling, litter variation, nursery pig, split weaning

Introduction

Mounting U.S. consumer pressure to transition away from individual stall housing in gestation necessitates consideration of alternative management strategies during lactation and gestation. Recent research has demonstrated that current sow lines may be more responsive to stimulation of estrus during lactation than reports from 20 years ago. In a concurrent study, we evaluated a lactational estrus stimulation strategy in which the duration of daily nursing was reduced beginning on d 18 of lactation by weaning the heaviest pigs early and creating combined litters that nursed each sow only 12 h/d. Because reducing the suckling stimulus seems to be a critical component in motivating lactational estrus expression, characterizing the effects of this practice on piglet performance is important.

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Here we report the effects of combining SW and RS on piglet performance during an extended lactation and the early nursery period. This treatment provides additional nursing time for lightweight pigs but requires larger littermates to be weaned earlier. The effects of this altered weaning strategy on both weight groups are reported.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved the protocol used in this experiment. The trial was conducted at the Kansas State University Swine Teaching and Research Center in Manhattan, KS.

A total of 611 pigs (PIC 327 × 1050) originating from 54 sows in 2 farrowing groups were used. Parity ranged from 1 to 5 and averaged 2.6 ± 1.5. Prior to farrowing, pregnant sows were moved into a single farrowing room (29 individual farrowing crates; 7.0 × 2.0 ft for the sow and 7.0 × 5.2 ft for pigs). Litter size at birth varied from 3 to 18 live pigs and was approximately equalized within 2 d after farrowing by cross-fostering pigs within each parity group (primiparous or multiparous), resulting in an average litter size of 11.6 ± 1.2 pigs. Within 1 d after farrowing, piglet BW was determined, pigs were individually ear-notched, and pigs received an injection of 2 mL iron dextran and 1 mL of antibiotic (Naxcel; Zoetis Animal Health, Florham Park, NJ). Male pigs were castrated approximately 7 d after birth. Within each farrowing group, the day on which most of the litters were born was considered d 0 of lactation for the group, and all treatment procedures were performed on the same calendar day for all litters in the farrowing group. Litters were born from 4 d before to 3 d after d 0. Sows were fed a common lactation feed based on corn, soybean meal and 20% DDGS (1,472 kcal/lb, 21.6% CP, and 0.97% lysine), which was provided ad libitum after d 1 postfarrowing. Creep feed was not offered during lactation.

Control and altered suckling treatments (ALT) were implemented. Sows were allotted to treatments on d 18 of lactation by parity, BW, suckled litter size, and date farrowed. ALT sows were placed in adjacent pairs so litters could be combined and switched between sows by temporarily lifting the separating divider. On d 18, all but the 5 lightest-weight pigs from each ALT litter were split weaned (SW) and moved to the nursery. The remaining 5 lightweight pigs on paired ALT litters were then combined to form a new litter of 10 pigs. These combined litters were rotationally suckled (RS) between each of the paired sows at 12-h intervals (0600 and 1800), such that pigs had access to a sow 24 h/d, but each ALT sow was suckled for only 12 h/d. The farrowing room lights were left on for 24 h/d throughout lactation. This strategy was implemented from d 18 of lactation until ALT sows were weaned on d 25. Control sows were managed according to the farm's normal protocol, with weaning taking place on the afternoon of d 21.

At weaning on d 18 (SW), the afternoon of d 21 (control), or d 25 (RS), pigs were assigned to pens by BW with 7 pigs per pen. All weaned pigs were fed according to the same feed budget consisting of 4 lb/pig of a commercial Phase 1 diet followed by a Phase 2 diet until the end of the experiment. Each pen contained a 4-hole, dry self-feeder and a nipple waterer to provide ad libitum access to feed and water. Pigs were weighed individually at birth, at d 18, and at 3.5-d intervals (d 21.5, 25, 28.5, and d 32) to assess weight gain between different weaning ages.

All experimental data were analyzed using the MIXED procedure of SAS, version 8.1 (SAS Institute, Inc., Cary, NC). To assess treatment differences, weight gain (Table 1), variation in growth within litter (Table 2), and the association between piglet weight group and treatment (Table 3) were evaluated. For weight gain, pigs originating from both control and ALT sows were compared by retrospectively breaking control pigs into heavy- or lightweight categories based on d-18 weight, thus matching the proportion of ALT pigs allotted to RS or SW treatments. Pig was the experimental unit, and both nursery pen and farrowing group were included in the model as random effects. For variation in growth within litter, SD, CV, and the changes in SD and CV throughout the 14-d experiment were compared between control and ALT litters using litter as the experimental unit. For evaluating the association between piglet weight group and treatment, pig was the experimental unit, and pigs were assigned to 1 of 4 weight classifications based on d-18 weights: <10 lb, 10 to 12 lb, 12 to 14 lb, or >14 lb. Total weight gain and the average weight of pigs within each weight group were then compared across treatments with unequal replications. Least squares means were calculated for each independent variable, and treatment means were separated using preplanned CONTRAST statements in SAS. Statistical significance and tendencies were set at $P < 0.05$ and $P < 0.10$, respectively.

Results

Pigs assigned to control or ALT suckling treatments were similar in weight at allotment on d 18; however, an interaction was detected ($P < 0.01$) for each subsequent time point and for weight gain from d 18 to 32 in which RS pigs gained more weight than lightweight control pigs but SW pigs were lighter compared with the initially heavyweight controls. Comparing the collective performance of ALT pigs versus controls showed that although control pigs were heavier than ALT pigs at d 21.5, weights were similar at each subsequent time point, and the total gain from d 18 to 32 did not differ between the two suckling treatments. Finally, RS pigs were lighter ($P < 0.001$) than their SW counterparts at each time point, and the lightweight pigs within the control group remained lighter ($P < 0.001$) than the heavyweight control pigs.

The variation in pig weights within each litter was expressed as CV and SD. Litters where the ALT suckling treatment was applied had decreased CV ($P < 0.03$) at d 21.5 and d 32 corresponding to a greater reduction ($P < 0.01$) of CV relative to control litters over the 14-d experiment. Standard deviation decreased ($P < 0.03$) in ALT litters at d 21.5 and d 32 and tended to be lower on d 28.5. These reductions in SD led to a greater ($P < 0.001$) change in SD from d 18 to 32.

For pigs under 10 lb on d 18, ALT pigs were heavier ($P < 0.01$) than controls on d 25 and 32 and experienced greater ($P < 0.001$) BW gain from d 18 to 32. Conversely, ALT pigs >14 lb were lighter ($P < 0.01$) at d 21.5, d 28.5, and d 32 and experienced less ($P < 0.01$) BW gain compared with controls. The 12- to 14-lb controls were heavier ($P < 0.02$) on d 21.5 than their ALT counterparts, but otherwise pigs within the 10- to 12-lb and 12- to 14-lb categories performed similarly regardless of the suckling treatment applied.

Discussion

The application of an ALT suckling treatment during late lactation illustrates how piglet performance can be altered by weaning age and manipulation of suckling competition. Although overall performance of ALT pigs did not differ from controls, SW pigs experienced a more marked postweaning growth check, resulting in 15% poorer total gain compared with heavyweight controls. This reduced growth rate may be explained in part by the earlier weaning age, but it also may be related to the fact that SW pigs were grouped together whereas heavyweight control pigs were housed alongside lightweight controls at weaning. Nonetheless, the additional growth RS pigs experienced prior to weaning on d 25 resulted in a heavier BW at d 32 and a 15% improvement in total weight gain relative to lightweight controls.

The lighter SW pigs and heavier RS pigs potentiated a 50% reduction in the change in CV and SD for ALT versus control litters. Additional research is needed to determine whether these decreases in variation are maintained through time.

Further evaluation of d-18 weight categories revealed that overall differences between treatments occurred primarily because of changes in the weight of pigs in the <10 and >14 lb categories. As seen in Figure 1, <10-lb ALT pigs experienced 15% more gain than controls, but for the >14 lb group, ALT pigs were 8% lighter. It is logical that the lightest pigs may benefit most from the additional time on the sow with reduced competition from their heavier littermates, but it is intriguing that of the heavier-weight groups, pigs greater than 14 lb experienced the biggest setback in performance by weaning at d 18 rather than d 21.5.

In conclusion, the altered suckling method used to stimulate lactational estrus in sows did not appear to improve overall pig performance during late lactation and the early nursery period. However, variation in pig weight was reduced by both increasing gain and reducing the postweaning growth check of lightweight pigs, which simultaneously negatively affecting growth of the heavyweight pigs in the altered suckling treatment. Additional research is needed to determine whether this reduction in variation is sustained to market and its economic implications. Additional lactational strategies are also worth evaluating for their effects on pig performance.

Table 1. The effects of an altered suckling treatment (ALT) on piglet weights during late lactation and the nursery period[1]

	Control[2]			ALT[2]				Probability $P <$		
Item	Heavy[3]	Light[3]	Total	SW	RS	Total	SEM	Treatment × weight	Treatment	Weight
Pigs, n	164	125	289	183	139	322				
Weaning age, d	21.5	21.5	21.5	18.0	25.0	---				
Pig BW, lb										
d 18	13.78	10.59	12.19	13.87	10.69	12.28	0.172	0.98	0.62	< 0.001
d 21.5	15.74	12.17	13.95	14.43	12.60	13.51	0.161	< 0.001	0.03	< 0.001
d 25	17.06	13.46	15.26	16.79	14.42	15.61	0.215	< 0.01	0.12	< 0.001
d 28.5	19.12	15.24	17.18	18.37	15.79	17.08	0.253	< 0.01	0.68	< 0.001
d 32	21.52	17.28	19.40	20.86	18.23	19.55	0.588	< 0.01	0.60	< 0.001
Gain d 18 to 32, lb	7.74	6.69	7.21	6.99	7.55	7.27	0.727	< 0.001	0.67	0.08

[1] A total of 611 pigs (PIC 327 × 1050) originating from 54 litters in 2 farrowing replicates were used in this 14-d study with 7 pigs per pen after weaning. Birth weights of pigs averaged 3.25 lb and were similar between control and ALT treatments.

[2] Sows were allotted to 1 of 2 treatments at d 18 of lactation based on parity, sow weight, suckled litter size, and average piglet weight. The altered suckling treatment (ALT) involved split-weaning (SW) all but the 5 lightest-weight pigs on d 18. The ALT sows were then paired, and the lightweight pigs from 2 litters were combined and rotationally suckled (RS) between the pair of sows at 12 h intervals until weaning on d 25.

[3] Pigs from control sows were weaned on d 21.5 (afternoon of d 21) and allotted to nursery pens by weight and gender. Even though litters remained intact until weaning, control pigs are represented by heavy and lightweight categories using d-18 weights so comparisons can be made to the ALT treatment.

Table 2. The effects of an altered suckling treatment (ALT) on piglet weight variation within litter during late lactation and the early nursery period[1,2]

Item	Control	ALT	SEM	*P* <
Litters	25	28		
Pigs per litter	11.56	11.50		
Litter SD				
d 18	2.19	2.12	0.178	0.74
d 21.5	2.51	1.87	0.173	<0.01
d 25	2.51	2.27	0.171	0.27
d 28.5	2.80	2.38	0.170	0.07
d 32	3.11	2.55	0.290	0.03
SD change, d 18 to 32	0.92	0.43	0.133	<0.001
Litter CV, %				
d 18	17.9	17.2	1.64	0.70
d 21.5	17.9	13.9	1.39	0.02
d 25	16.4	14.6	1.11	0.22
d 28.5	16.2	13.9	1.05	0.12
d 32	16.0	13.0	1.14	0.03
CV change, d 18 to 32	-1.90	-4.20	0.628	<0.01

[1] A total of 611 pigs (PIC 327 × 1050) originating from 54 litters in 2 farrowing replicates were used in this 14-d study with 7 pigs per pen.

[2] Sows were allotted to 1 of 2 treatments at d 18 of lactation based on parity, sow weight, suckled litter size, and average piglet weight. The altered suckling treatment (ALT) involved split-weaning (SW) all but the 5 lightest-weight pigs on d 18. The ALT sows were then paired and the lightweight pigs from 2 litters were combined and rotationally suckled (RS) between the pair of sows at 12-h intervals until weaning on d 25.

Table 3. The association between piglet weight group and an altered suckling treatment (ALT) on piglet growth performance during late lactation and the early nursery period[1,2]

	Control				ALT					Probability $P <$			
Item	<10 lb	10–12 lb	12–14 lb	>14 lb	<10 lb	10–12 lb	12–14 lb	>14 lb	SEM	<10 lb	10–12 lb	12–14 lb	>14 lb
Pigs, d 18	58	65	68	98	52	77	91	102					
% of total	20%	22%	24%	34%	16%	24%	28%	32%					
Pig BW, lb													
d 18	8.36	10.95	12.84	15.46	8.30	11.05	12.95	15.32	0.194	0.75	0.56	0.51	0.33
d 21.5	9.66	12.62	14.74	17.55	9.97	12.31	14.24	15.98	0.250	0.21	0.17	0.02	<0.001
d 25	10.76	14.12	16.14	18.80	11.60	14.18	16.50	18.43	0.300	0.01	0.82	0.15	0.10
d 28.5	12.32	15.90	18.11	21.05	12.84	15.62	17.89	20.18	0.320	0.11	0.32	0.42	<0.01
d 32	14.10	17.90	20.50	23.64	15.06	18.04	20.32	22.84	0.375	0.01	0.67	0.56	<0.01
Gain d 18 to 32, lb	5.72	6.91	7.63	8.16	6.71	6.97	7.40	7.57	0.302	<0.001	0.81	0.37	<0.01

[1] A total of 611 pigs (PIC 327 × 1050) originating from 54 litters in 2 farrowing replicates were used in this 14-d study with 7 pigs per pen.

[2] Sows were allotted to 1 of 2 treatments at d 18 of lactation based on parity, sow weight, suckled litter size, and average piglet weight. The altered suckling treatment (ALT) involved split-weaning (SW) all but the 5 lightest-weight pigs on d 18. The ALT sows were then paired, and the lightweight pigs from 2 litters were combined and rotationally suckled (RS) between the pair of sows at 12-h intervals until weaning on d 25.

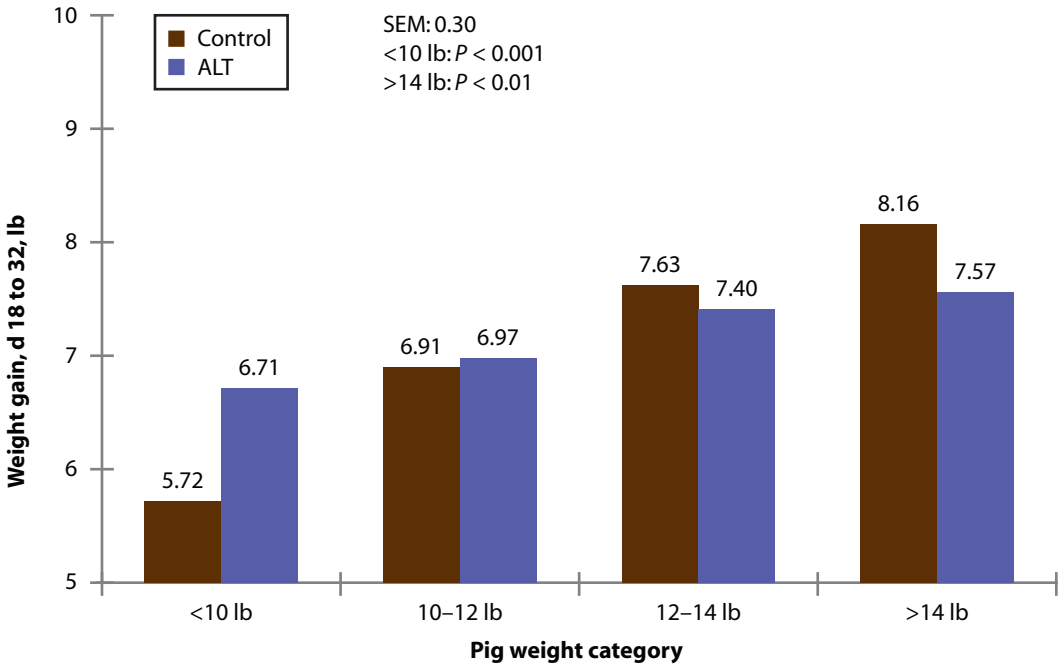

Figure 1. Weight gain from d 18 to 32 for pigs of different weight categories between control and altered suckling treatments (ALT).