

AN ABSTRACT OF THE THESIS OF

CALVIN WALKER
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Abstract approved:

David C. England

An experiment was conducted with 51 control and 51 experimental confinement-managed purebred Yorkshire sows of various parities to (1) determine whether confinement-managed sows during lactation would exhibit estrus, mate, and conceive as a consequence of a daily regimen of a short period of separation from their litters, mixing sows together during the separation period, and exposure to a boar during this period; (2) assess effects of the experimental regimen on the preweaning and early postweaning performance of litters currently nursing; and (3) assess effects of the experimental regimen on size and performance to weaning of litters farrowed as a consequence of mating during lactation.

Separation of dams from their litters for six hours a day for a minimum of seven and a maximum of 20 days during lactation resulted in occurrence of estrus and mating by 80% of sows during lactation with no adverse effect on preweaning performance of current and subsequent litters; 90% of the control sows mated during a 20 day period following weaning. Postweaning average daily gain and feed intake for the current litters of the experimental group sows during each of the three weeks of measurement was greater than for the

litters from the control sows; these differences were statistically significant ($P < .01$) in the third week.

Possible advantages of using the experimental regimen rather than mating after weaning on 42 days age of litter include: (1) shortening the interval between farrowing and mating comparable to that achieved by weaning at three weeks but without employing early weaning, (2) less intensity and shorter duration of impaired postweaning performance, (3) saving of gestation feed by breeding three weeks earlier, (4) an increase of about 18% in pigs produced/sow/year, (5) a more flexible use at weaning of the already-bred sows for rearing young litters of foster pigs without causing delay in production of next litter.

REPRODUCTIVE AND LITTER PERFORMANCE
OF SOWS MATED DURING LACTATION

by

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Redacted for Privacy

Professor of Animal Science
in charge of major

Redacted for Privacy

Head of Department of Animal Science

Redacted for Privacy

Dean of Graduate School

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REPRODUCTIVE AND LITTER PERFORMANCE OF SOWS MATED DURING LACTATION

Calvin Walker and David C. England¹

SUMMARY

An experiment was conducted with 51 control and 51 experimental confinement-managed purebred Yorkshire sows of various parities to (1) determine whether confinement-managed sows during lactation would exhibit estrus, mate, and conceive as a consequence of a daily regimen of a short period of separation from their litters, mixing sows together during the separation period, and exposure to a boar during this period; (2) assess effects of the experimental regimen on the preweaning and early postweaning performance of litters currently nursing; and (3) assess effects of the experimental regimen on size and performance to weaning of litters farrowed as a consequence of mating during lactation.

Separation of dams from their litters for six hours a day for a minimum of seven and a maximum of 20 days during lactation resulted in occurrence of estrus and mating by 80% of sows during lactation with no adverse effect on preweaning performance of current and subsequent litters; 90% of the control sows mated during a 20 day period following weaning. Postweaning average daily gain and feed intake for the current litters of the experimental group sows during each of the three weeks of measurement was greater than for the litters from the control sows; these differences were statistically significant ($P < .01$) in the third week.

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¹Department of Animal Science, Oregon State University, Corvallis.

mating after weaning on 42 days age of litter include: (1) shortening the interval between farrowing and mating comparable to that achieved by weaning at three weeks but without employing early weaning, (2) less intensity and shorter duration of impaired postweaning performance, (3) saving of gestation feed by breeding three weeks earlier, (4) an increase of about 18% in pigs produced/sow/year, (5) a more flexible use at weaning of the already-bred sows for rearing young litters of foster pigs without causing delay in production of next litter.

(Key Words:Yorkshire Sows, Mating, Litter Productivity, Lactation Separation, Weaning

INTRODUCTION

Maximum litter productivity is of key economic importance in swine production; regular and frequent farrowing by each dam is necessary for highest litter productivity. Sows are generally mated at first estrus after weaning litters at conventional or early-weaning ages. Most reported research involving breeding at early post-farrowing has been conducted with sows from which litters were early-weaned (Self and Grummer, 1958; Krug et al., 1974; Svajgi et al., 1974; Krug et al., 1975; Hays et al., 1978; Allrich et al., 1979). Pioneer research in breeding during lactation showed promising results (Smith, 1960; Crighton, 1970; Rowlinson et al., 1975; Rowlinson et al., 1977; Walker and England, 1978). No reports were found in the literature on research with early mating of confinement-managed sows during lactation without use of exogenous products to induce estrus.

The present study was designed to: (1) determine whether matings of confinement-managed sows during lactation can be induced by a

combination of a short daily period of separation from the litter, mixing sows together during the separation period, and exposure to a boar during the separation period; (2) assess effects of the experimental regimen on litters currently nursing; (3) assess effects of the experimental regimen on litters farrowed as consequence of mating during lactation.

EXPERIMENTAL PROCEDURE

Sows and litters were housed in farrowing crates until litters were approximately 21 days of age; afterward, each sow and litter was housed in a 2.44 x 3.05 meter pen until weaning of litter at 42 days of age. Separation commenced when litters were 18 to 24 days of age; separation was for six hours daily until mating occurred or for 20 days if not mated sooner. Equal numbers of dams of similar parity were allocated to the control and treatment group; in most instances, sows of a particular pair were mated to the same boar to minimize possible boar effect on reproductive performance. During lactation, sows were fed a 15% crude protein ration containing 3096 kilocalories/kg; this was fed in the amount of 2.72 kg/day plus 227 g/pig nursing. During gestation all sows were fed 2.27 kg/head/day of a 14% crude protein ration containing 2808 kilocalories/kg.

During the first two days of separation the sows were grouped in a pen in the broodstock building without direct exposure to a boar. Beginning on the third day, a boar was in the pen with the group for the six-hour periods. After weaning, control sows were housed as a group in the broodstock barn; they were observed daily for signs of estrus

and were exposed individually to a boar in a breeding pen for mating on two consecutive days during apparent estrus.

Data taken on current litters for both the control and experimental group were: individual weight on day of initial separation and at weaning; litter feed consumption during this time; and individual pig weekly weight and litter feed consumption for each of the first three weeks after weaning. Data recorded for subsequent litters were number and weight of pigs born and number and weight of pigs weaned.

The unpaired t-test for differences between means of independent samples (Snedecor and Cochran, 1967) were used for data analysis. Association of parity of dam and number of pigs nursing, parity of dam and days to mating, and number nursing and days to mating were analyzed by calculation of coefficients of correlation (Treloar, 1951).

RESULTS AND DISCUSSION

Pig Performance:

Analysis of data (table 1) for various preweaning traits showed no significant ($P < .05$) differences between current litters of the control and experimental groups of dams; the average feed intake/pig/day however, was non-significantly higher ($P < .05, < .10$) for the litters subjected to short periods of daily separation from their dams. Litters not subjected to separation had slightly, but not significantly, higher average pig weight at weaning. Smith (1960) also did not observe a significant difference in weaning weights of pigs separated from their dams for 12 hours daily compared to non-separated pigs. Short periods of daily separation during lactation did not affect the percentage of

TABLE 1. INFLUENCE OF SHORT-TERM DAILY SEPARATION OF DAMS FROM LITTERS ON PREWEANING SURVIVAL AND WEIGHTS OF CURRENT LITTERS

	Control			Treatment		
	Number	Mean	SE	Number	Mean	SE
Av. initiation pig wt., kg.	44	4.3 ^a	±.12	49	4.4 ^a	±.13
Av. initiation no. pigs	44	9.2 ^a	±.28	49	8.7 ^a	±.30
Av. no. pigs at weaning	44	8.4 ^a	±.32	49	7.8 ^a	±.34
Av. weaning wt/pig, kg.	44	8.4 ^a	±.31	49	8.1 ^a	±.31
% initial pig remaining at weaning	44	91%		49	90%	
Av. daily gain/pig, kg.	44	.17 ^a	±.01	49	.15 ^a	±.01
Av. feed intake/pig/day, kg.	44	.10 ^a	±.01	49	.12 ^a	±.01

^aMeans within horizontal columns having the same superscript are not significantly different ($P > .05$).

piglets suckled from initiation to weaning (table 1). No direct measure was made of total milk production by control and experimental sows; the non-significantly lower average pig weaning weight does not provide a reliable measure of milk production because there is some evidence of increased feed intake by the separated pigs which may have compensated for at least some decreased milk production.

Table 2 depicts the trends in postweaning performance of litters from control and experimental dams. Postweaning average daily gain and feed intake for litters from the treatment-group sows increased more steadily than for litters from control dams through the three postweaning weekly intervals. Average daily gain and feed intake/pig were higher in each of the three postweaning weeks for the pigs from the treatment-group dams than for the control litters but was significantly so ($P < .01$) only during the third week. Litters which experienced daily periods of separation before weaning appear to have undergone preconditioning for weaning with resultant beneficial effect, as reflected by growth and feed intake, on adaptation to postweaning conditions.

Breeding Performance:

Numerous reports show the sow to be anovulatory throughout lactation (Burger, 1952; Wagner and Oxenrider, 1971; Polge, 1972). However, reports of Smith (1960), Phelps (1969), Crighton (1970), Rowlinson et al. (1977), and Walker and England (1978) document that it is possible to consistently induce estrus by imposition of stimulatory management regimes during lactation.

In the present study, the percentage of sows mated within 20 days

TABLE 2. POSTWEANING GAINS AND FEED INTAKE OF PIGS WHICH HAD OR HAD NOT EXPERIENCED SHORT DAILY PERIODS OF SEPARATION FROM DAMS DURING LACTATION

Item	<u>ADG</u>				<u>Feed Intake/Day</u>			
	Control		Treated		Control		Treated	
	<u>Mean</u>	<u>SE</u>	<u>Mean</u>	<u>SE</u>	<u>Mean</u>	<u>SE</u>	<u>Mean</u>	<u>SE</u>
Number of litters	44		49		44		49	
Initiation - weaning	.17 ^a	±.01	.15 ^a	±.01	.10 ^a	±.01	.12 ^a	±.01
1-7 days postweaning	.22 ^a	±.02	.25 ^a	±.02	.55 ^a	±.04	.63 ^a	±.04
8-14 days postweaning	.25 ^a	±.02	.30 ^a	±.02	.66 ^a	±.05	.77 ^a	±.04
15-21 days postweaning	.35 ^b	±.02	.45 ^b	±.02	.92 ^b	±.05	1.18 ^b	±.05
1-21 days postweaning	.27 ^a	±.02	.33 ^a	±.02	.71 ^a	±.05	.86 ^a	±.05

^aValues within horizontal columns for each trait having this superscript are not significantly different ($P > .05$).

^bValues within horizontal columns for each trait having this superscript are significantly different ($P < .01$).

after weaning or after exposure during lactation was 91% and 80%, respectively. Mating performance during lactation by the group subjected to the management regimen was consistent with reports by Phelps (1969) and Petherwick et al. (1977) in which, for non-confinement-managed dams, 85% vs. 77.5% of post-lactation and during-lactation dams exhibited estrus.

Figure 1 shows the percentage of dams mating within 20 days of exposure during lactation or postweaning. Control sows exhibited peak mating during the 1-5 day period with a range of 3-18 days within the 20-day experimental period; for the experimental sows, peak mating was during the 6-10 day period of short daily separation during lactation. A similar trend in number of sows exhibiting estrus was reported by Rowlinson et al. (1975). In our study, three of the four control and seven of the nine treatment-group sows which did not mate within 20 days exhibited estrus beyond the 20-day experimental period with an average of 27 days for each group.

Table 3 shows average days from weaning to mating of 6.7 for control sows; 7.3 days from first day of separation during early lactation for the sows in the experimental group. Days to mating for first parity control sows was 5.9 vs. 7.4 for other parity sows; for experimental dams, these values were 8.0 and 6.5, respectively; the difference between first parities and others were not statistically significantly different for either group, nor were they different between control and treated groups for either parity class ($P > .15$, table 4). Experimental dams mated at 28.3 days average age of their litters; average age of

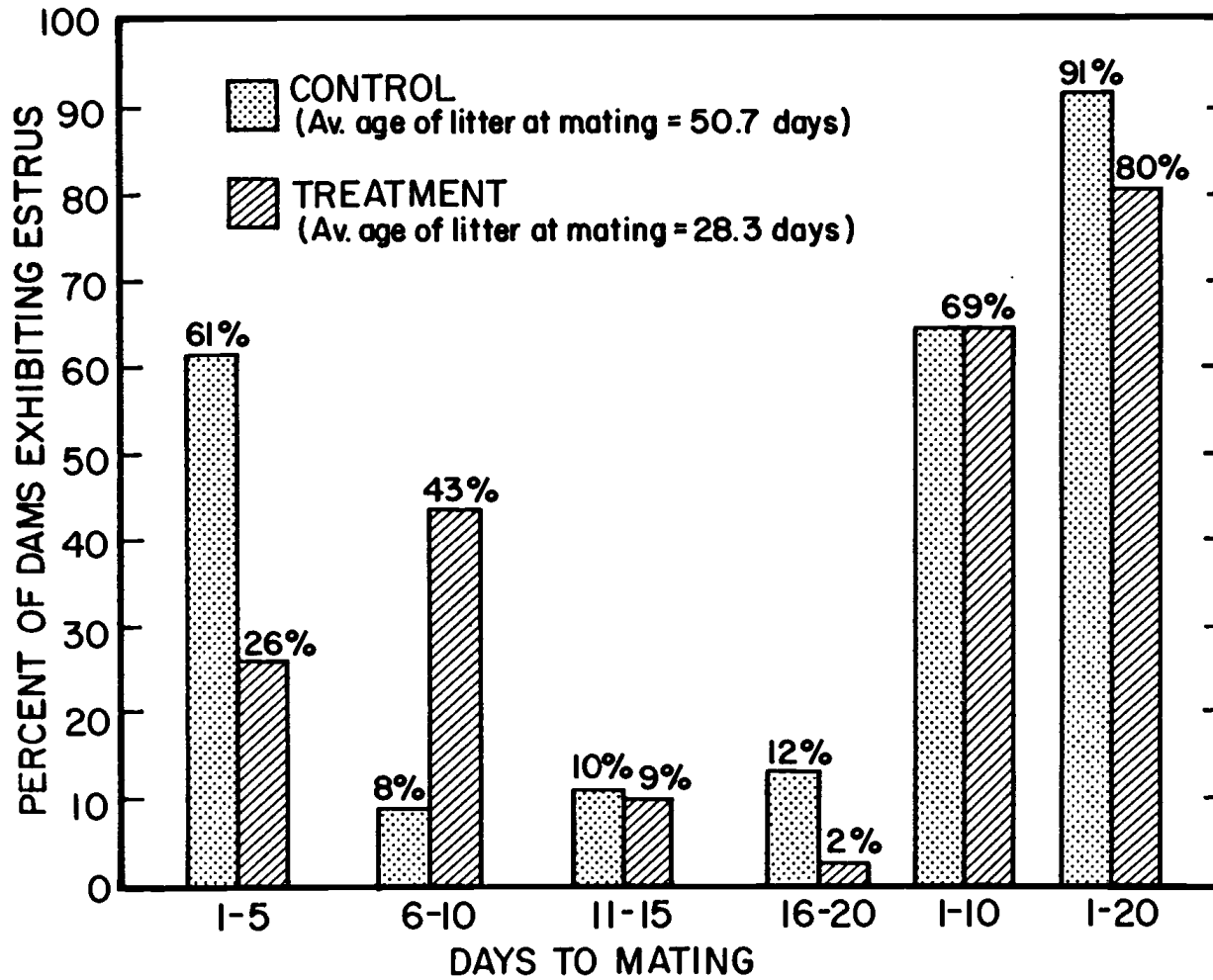


Figure 1. Percentage of dams mating within 20 days of exposure during lactation or postweaning.

TABLE 3. REPRODUCTION AND LITTER PERFORMANCE OF SOWS MATED WITHIN 20 DAYS AFTER WEANING OR AFTER SEPARATION FROM LITTERS DURING LACTATION

	Control			Treatment		
	<u>Number</u>	<u>Mean</u>	<u>SE</u>	<u>Number</u>	<u>Mean</u>	<u>SE</u>
Days to mating	36	6.7 ^a	±.82	37	7.3 ^a	±.61
Total number born	36	10.3 ^a	±.57	36	10.4 ^a	±.54
Number born alive	36	9.7 ^a	±.58	36	10.1 ^a	±.44
Av. birth wt., kg.	36	1.36 ^a	±.04	36	1.41 ^a	±.03
Number weaned	29	7.5 ^a	±.43	33	7.6 ^a	±.38
Av. weaning wt/pig, kg.	29	8.86 ^a	±.39	33	9.45 ^a	±.42

^a Means within horizontal columns having the same superscript are not significantly different (P>.05).

TABLE 4. REPRODUCTIVE PERFORMANCE AND LITTER PRODUCTIVITY OF SOWS MATED DURING LACTATION OR AFTER WEANING

	1st Parity			Other Parity		
	Number ^c	Mean	SE	Number ^c	Mean	SE
	<u>CONTROL</u>					
Number pigs nursing	22	8.6	± .50	25	8.2	± .34
Days from weaning to mating	16	5.9	± .92	20	7.4	±1.31
Total number born	16	9.2 ^a	±1.74	20	11.3 ^a	± .82
Number born alive	16	8.6	± .70	20	10.5	± .87
Av. birth wt., kg.	16	1.32	± .65	20	1.37	± .07
Number weaned	12	7.6	± .48	17	7.3	± .69
Av. weaning wt./pig, kg.	12	8.6	± .56	17	9.1	± .58
	<u>EXPERIMENTAL</u>					
Number pigs nursing	16	8.3	± .46	25	9.0	± .48
Days from exposure to mating	13	8.0	±1.08	24	6.5	± .72
Total number born	13	9.0 ^b	± .62	23	11.8 ^b	± .68
Number born alive	13	8.4 ^b	± .44	23	11.4 ^b	± .48
Av. birth wt., kg.	13	1.44	± .05	23	1.40	± .03
Number weaned	12	7.3	± .42	21	7.9	± .57
Av. weaning wt./pig, kg.	12	8.9	± .51	21	9.6	± .61

^aValues within horizontal columns having this superscript are significantly different (P<.05).

^bValues within horizontal columns having this superscript are significantly different (P<.01).

^cDenotes number of sows or litters for each trait.

of litter at mating of control dams was 50.7 days. Correlations were calculated within the control and experimental sow groups to determine whether association existed between parity of dam and number of pigs nursing, parity of dam and days to mating, and number nursing and days to mating; all correlations were very low and non-significantly different from zero.

Days to mating of second or later parity sows in our study was similar to that reported by Smith (1960); first parity in their study required 13-16 days of separation to induce estrus whereas eight days to mating for first parity sows in our experiment was not different from that for other parity sows.

Litter Productivity:

Performance of sows mated within 20 days either after weaning or after exposure during lactation was not significantly different ($P > .05$) for total number born, birth weight, number weaned and weaning weight (table 3). Table 4 shows comparison of litter productivity of sows which were mated as first parity dams during lactation vs. later parity dams which farrowed concurrently and were similarly mated; 16 of 22 and 20 of 25, respectively, mated within a 20 day period in the control group; 13 of 16 and 24 of 25, respectively, in the experimental group mated within 20 days after exposure. Total number born was 9.0 vs. 11.8 and number born alive was 8.4 and 11.4, respectively, for first parity vs. second and later parity dams in the experimental group. These differences were significant ($P < .01$, table 4). For the control group (table 4), first vs. other parity dams differed significantly in total

born at $P < .05$ with averages of 9.2 vs. 11.3, but number born alive with averages of 8.6 and 10.5, respectively, were not significant at this level.

In both parity groups, within both the control and experimental groups, occurrence of severe MMA resulted in loss or removal of pigs from some litters before weaning. Estrus and mating occurrence and litter performance of both the control and treatment groups in this experiment are below that usually achieved in this herd. Specific causes are not fully apparent; in general, poor milk production, including MMA, has been an apparent contributor to below normal pig survival and growth. These problems appeared to be of similar magnitude in the control and experimental groups.

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