Effect of Lactation Length and Fasting on Various Reproductive Phenomena of Sows

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J Anim Sci 1979. 48:359-362.

EFFECT OF LACTATION LENGTH AND FASTING ON VARIOUS REPRODUCTIVE PHENOMENA OF SOWS[1]

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SUMMARY

One-hundred-seven Duroc sows were used to determine the effects of lactation length and postweaning fast on reproductive performance of weaned sows. The study involved lactation lengths of 21 or 30 days integrated with fasting periods of either 0, 2, 3 or 4 days. Effects of treatments on interval to estrus after weaning, number of corpora lutea and number of normal embryos present at day 25 of gestation, number of pigs born and number of pigs born alive per sow were determined. Within lactation group, length of fasting did not alter interval from weaning to estrus. Sows lactating 30 days returned to estrus in a shorter ($P<.01$) interval than did sows lactating 21 days (5.0 *vs* 8.2 days). Ovulation rate was reduced ($P<.05$) when sows were fasted 4 days after a 30-day lactation. Number of normal embryos was not affected by lactation length or fasting. Percentage embryo survival was not affected by fasting; however, sows lactating 30 days had better embryo survival, 79.0 *vs* 70.7%, when compared to sows lactating 21 days. Number of pigs born and number of pigs born alive were increased ($P<.05$) when sows lactated 30 days as opposed to 21 days. Fasting, after a 30-day lactation, significantly reduced the number of pigs born and number of pigs born alive. It would appear that postweaning fasting has no beneficial effect on ovulation rate, number of total embryos or percentage embryo survival, nor does it reduce the interval to first estrus after weaning. Also, 30-day lactation lengths resulted in improved sow performance in the subsequent gestation.

(Key Words: Swine, Fasting, Estrus, Ovulation, Embryo Survival.)

INTRODUCTION

Management schemes are needed for increasing reproductive efficiency of sows after weaning. Lactation length and its influence on sow reproduction has been extensively investigated (Svajgr *et al.*, 1974; Moody and Speer, 1971; Pay, 1973; Krug *et al.*, 1974, 1975; Varley and Cole, 1976). A limited number of studies have examined the influence of fasting on sow reproductive traits (Brooks and Cole, 1972, 1973; Aherne *et al.*, 1976). No comprehensive study has been reported that examined reproductive traits of sows after a postweaning fast.

Objectives were to determine weight loss of sows during fasting periods, interval to first estrus after weaning, ovulation rates, embryo survival at 25 days postbreeding, number of pigs born and number of pigs born alive per sow after various fasting periods imposed at weaning.

EXPERIMENTAL PROCEDURE

One-hundred-seven Duroc gilts with a mean age at breeding of 273 days were used in a 2 × 4 factorial design consisting of two lengths of lactation (21 or 30 days) and four periods of fasting (0, 2, 3 or 4 days) imposed at weaning. The experiment was divided into four trials with lactation length varied between trials. No two trials were run in the same season.

In each trial, nulliparous Duroc gilts were housed in open-lot soil surfaced pens with an enclosed shed available for shelter. Each gilt received 2.3 kg feed (16% crude protein, 100% NRC requirements) per day from breeding until farrowing. Gilts were checked for estrus twice daily, 0800 and 2000 hr, and were bred by either Duroc or Chester White boars 12 and 24 hr after onset of estrus. During winter months the evening estrus check was at 1600 hr because of early darkness. After breeding, gilts were allowed to gestate and farrow normally. Following parturition, gilts were randomly assigned to fasting treatment. Offspring were fostered to

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various litters to maintain an average of eight nursing piglets per sow. During lactation sows were fed at a rate of 1.8 kg feed plus .45 kg per nursing pig per day (15% crude protein, 100% NRC requirements). One-half of the ration was fed in the morning with the remainder fed in the evening. At weaning, sows were weighed and fasting commenced. Sows were fasted and thereafter maintained in open-lot pens containing a maximum of 16 sows. During the fasting period all feed was removed, however water was available. Sows on the zero days fast were weighed again 2, 3 and 4 days after weaning, with maximum weight loss recorded. Fasted sows were weighed again at the end of their fasting period. Sows were returned to the gestation ration after fasting.

After weaning, sows were checked for estrus and mated to Duroc boars 12 and 24 hr after onset of estrus. After mating, one-half of each treatment group were randomly designated for slaughter 25 days postbreeding. The remaining one-half were allowed to complete gestation and farrow.

The following data were collected at slaughter: total number of corpora lutea present; number of normal, viable embryos; number of abnormal embryos. Corpora lutea present on the ovaries were assumed to represent the number of ovulations. Embryos with a detectable heartbeat and of a size comparable to their contemporaries were judged to be normal. Abnormal embryos were those which lacked a heartbeat and/or contained a hemmorhage or showed signs of atrophy. Farrowing data included number of pigs born and number of pigs born alive per sow.

Data were analyzed by a least squares procedure and Student's *t*-test (Steel and Torrie, 1960). Differences due to trial were accounted for in the analysis mode.

RESULTS AND DISCUSSION

Fasting for four days after either lactation length and three days after the 30 day lactation length influenced ($P<.01$) weight loss (table 1). A correlation of .70 ($P<.01$) existed between days fasted and weight loss. Weight loss in sows has been shown to be related to the degree of fasting (Ray and McCarty, 1965; Brooks and Cole, 1973). For each fasting period, those sows that lactated 30 days lost more weight than those lactating 21 days. After the longer lactation period sows are more likely to be in a slightly emaciated condition at weaning, therefore the stress of fasting would cause increased weight loss.

Within either lactation treatment there was no significant effect of fasting on number of days to return to estrus after weaning (table 1). In the 30-day lactation treatment, fasting tended to delay return to estrus activity. This trend was not observed in the 21-day lactation treatment. There was a decrease in interval from weaning to estrus when lactation length was increased from 21 to 30 days. The average interval from weaning to estrus was 8.2 days when lactation was 21 days as compared to 5.0 days when lactation was 30 days. This reduction ($P<.01$) in the rebreeding interval agrees with findings of other researchers (Moody and Speer, 1971; Krug *et al.*, 1974; Svajgr *et al.*, 1974). It was evident from these data that fasting did not reduce the interval from weaning to estrus and as other researchers have indicated may in fact delay onset of estrus (King, 1974; Brooks and Cole, 1973).

There was no significant difference in corpora lutea number for sows lactating 21 or 30 days (table 1). Mean corpora lutea number for the 21 and 30 day lactation groups was 14.1 and 13.4, respectively. Other workers also found that lactation length did not alter ovulation rate (Moody and Speer, 1971; Svajgr *et al.*, 1974; Varley and Cole, 1976). Fasting had no effect on ovulation rate within the 21-day lactation group. Within the 30-day lactation group, as the fasting period increased, number of corpora lutea on the ovaries decreased. There was a decrease ($P<.05$) in ovulation rate between sows in zero and 4-day fasted groups (14.8 *vs* 12.6). A similar decline in ovulation rate due to fasting had been demonstrated by Ray and McCarty (1965), Brooks and Cole (1973) and Anderson (1975). Fasting may decrease or inhibit synthesis and/or release of the gonadotropins. If this were the case, ovulation rate would decline under a fasting regimen. Crighton and Lamming (1969) measured follicle stimulating hormone and luteinizing hormone concentrations in serum of sows, but the effect fasting has on gonadotropin levels has not been ascertained.

Number of normal embryos present at 25 days postbreeding was not affected by lactation length (table 1). Moody and Speer (1971) reported that as lactation length increases, number of normal embryos per sow increases. In the present study, only two lactation lengths

TABLE 1. EFFECT OF LACTATION LENGTH AND FASTING ON REPRODUCTIVE PHENOMENA OF THE SOW[a]

Lactation length (days)	Fasting period (days)	Weight loss during fast[b] (kg)	Days to first estrus[b]	No. of CL at slaughter	No. of embryos at slaughter	Embryo survival (%)	No. of pigs born[c]	No. of pigs born alive
21	0	5.6[d] .7 (9)	8.1 2.0 (8)	14.4 .9 (5)	10.5 1.2 (4)	72.7 7.7 (4)	9.5 1.5 (2)	9.5 1.5 (2)
21	2	11.9 1.7 (8)	8.6 1.7 (8)	13.5 1.0 (4)	9.0 2.5 (3)	65.1 20.0 (3)	8.5 1.6 (4)	8.3 1.3 (4)
21	3	12.3 .7 (8)	8.3 1.7 (8)	15.8 .9 (4)	11.5 1.7 (4)	72.9 9.1 (4)	7.7 .7 (3)	7.3 .3 (3)
21	4	13.7[d] .8 (8)	7.7 .9 (7)	12.3 .3 (3)	8.5 2.5 (2)	70.9 20.8 (2)	9.8 1.4 (4)	9.5 1.4 (4)
30	0	8.5[de] .9 (21)	4.1 .2 (20)	14.8[f] .7 (12)	11.9 .7 (12)	80.5 3.0 (12)	11.8[f] 1.0 (8)	11.3[d] 1.0 (8)
30	2	12.9 .6 (16)	5.1 .5 (14)	13.0 1.3 (8)	10.3 .9 (8)	80.7 4.9 (8)	8.0[f] 1.1 (6)	6.8[de] .7 (6)
30	3	14.9[d] .6 (16)	6.1 1.0 (13)	13.3 .7 (7)	10.7 1.8 (6)	77.7 13.3 (6)	10.5 .8 (6)	9.7 1.1 (6)
30	4	16.7[e] .7 (21)	5.2 .4 (21)	12.6[f] .6 (14)	9.7 .5 (14)	77.4 3.2 (14)	11.3 .7 (6)	11.0[e] .4 (6)

[a] Data presented as means ± SE, number of sows marked in parentheses. Failure to return to estrus and loss of entire litters resulted in varying N values.

[b] Means between lactation groups differ at $P<.01$.

[c] Means between lactation groups differ at $P<.05$.

[d,e] Means, within a lactation group, followed by the same superscript differ at $P<.01$.

[f] Means, within a lactation group, followed by the same superscript differ at $P<.05$.

were evaluated and due to their similarity, no significant effect of lactation length could be ascertained. Within either lactation group, fasting did not alter number of normal embryos present at 25 days gestation.

The number of abnormal embryos observed was minimal. Of 566 embryos examined, 10 (1.8%) were abnormal. The distribution of abnormal embryos among the fasting periods were 0, 5, 3 and 2 for 0, 2, 3 and 4 days fasting, respectively.

Embryo survival for the two lactation lengths (21 and 30 days) was 70.7 and 79.0%, respectively. Although this difference was not significant, there was a trend for increased embryo survival as lactation length increased (table 1). Within either lactation treatment there was no significant effect of fasting on embryo survival. In contrast, Ray and McCarty (1965) found that fasting significantly improved embryo survival. However, their work involved imposition of a fasting treatment on gilts after mating. There is a distinct void in the literature concerning fasting imposed at weaning and its effect on uterine environment and embryo survival.

There was an increase ($P<.05$) in number of pigs born when sows lactated 30 days as opposed to 21 days (table 1). This was a reflection of improved embryonic survival of sows with longer lactation lengths. Within the 30-day lactation treatment, fasting reduced ($P<.05$) the number of pigs born and number of pigs born alive per sow. However, this reduction was not significant for all fasting levels.

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