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ESTRUS AND EARLY PREGNANCY IN SOWS WEANED AT LESS THAN 11 OR MORE THAN 23 DAYS: EFFECTS OF VITAMIN A AND GONADOTROPIN TREATMENTS¹

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Summary

The problem of reduced reproductive performance in sows weaned at 5 to 11 days (early weaned) after farrowing was assessed by comparing estrous and embryonic traits in these sows and others weaned at 23 to 31 days postpartum. The effects of treatment of both groups of sows with PG600® and vitamin A also were studied. PG600® increased the number of sows in estrus regardless of weaning age and reduced the interval from weaning to estrus for early-weaned sows. Both vitamin A and PG600® tended to increase the number of embryos recovered at 11.5 days after the onset of estrus.

(Key Words: Estrus, Embryo Survival, PG600®, Gonadotropins, Vitamin A.)

Introduction

New production protocols in the swine industry (referred to as "multiple-site production", "segregated early weaning", etc.) require weaning pigs at younger ages than previously. The reproductive performance of sows may be a problem when weaning occurs earlier than 3 weeks and they are scheduled for immediate rebreeding. Although the problems of a decreased estrous response and lower embryo survival are well known, the physiological causes have received limited attention. Further, current understanding of the successful reproductive function of the postpartum sow suggests that two treatments

may be useful for minimizing reproductive problems.

These two treatments are vitamin A and PG600®. Injection of vitamin A at weaning can increase the number of pigs in the subsequent litter, suggesting effects on either the ovary or the uterus. Further, other data indicate that PG600®, a product that includes two gonadotropic hormones, hastens estrus in sows. These considerations led us to conduct the experiment reported here.

Procedures

After nursing their first litters for either 5 to 11 days (early weaned) or 23 to 31 days (conventionally weaned), 53 sows were assigned to either receive PG600® or saline at weaning (hormone treatment). One half of the sows receiving each hormone treatment received vitamin A (1,000,000 IU) at weaning and the other half received a placebo injection (the vehicle used for the vitamin A but not containing the vitamin). This provided a two × two factorial design for testing the effects of treatments singly or in combination. The injection treatments were applied to the two weaning ages in a 2 × 2 × 2 factorial arrangement.

Beginning 3 days after weaning, sows were checked for estrus three times per day by exposing them to a boar and testing for a standing reaction. Ovulation rate and early embryonic survival and development were

¹The authors appreciate the donation of injectable vitamin A and placebo by Phoenix Scientific, St. Joseph, MO.

evaluated at 11.5 days after the onset of estrus. At that time, sows were subjected to surgery, and the number of corpora lutea counted as a measure of the number of eggs ovulated. The uterus was flushed and embryos counted and measured.

Results and Discussion

No interactions among the treatments were detected. The estrous response is presented in Table 1. Vitamin A did not affect the occurrence of estrus or the interval from weaning to estrus. However, effects of both the postpartum interval and PG600® treatment were apparent. Early-weaned sows were less ($P < .05$) likely to return to estrus during the 10-day detection period and took longer ($P < .05$) to return to estrus. Injection of PG600® increased ($P < .025$) the number of both early- and conventionally weaned sows in estrus. Injection of PG600® also shortened ($P < .05$) the interval to estrus for early-weaned but not conventionally weaned sows.

Embryo development and survival are presented in Table 2. Sows weaned early had lower ($P < .05$) ovulation rates, and fewer ($P < .05$) embryos were recovered

from their uterine. However, the ovulations represented by embryos similar for early- and conventionally weaned sows. Both vitamin A and PG600® increased ($P < .05$) the number of embryos recovered. The two treatments appear to increase the number of embryos by different mechanisms. Although not statistically significant, PG600®-treated sows ovulated numerically more eggs. This effect seemed more pronounced for conventionally weaned sows. In contrast, vitamin A-treated sows tended ($P = .10$) to have higher embryo survival. None of the treatments affected diversity in embryo development.

Responses of the sows in this experiment indicated that PG600® is an effective treatment for hastening return to heat by primiparous sows after either early or conventional weaning. The data also suggest that vitamin A treatment may increase early embryonic survival. Samples collected from these sows will be evaluated to assess effects of the treatments on uterine function. It is somewhat surprising that weaning at 5 to 11 days did not decrease early embryonic survival. Perhaps the effects of a shortened postpartum period on embryo survival become apparent after day 11.5.

Table 1. Estrous Traits of Early-Weaned and Conventionally Weaned Sows

| Treatment | No. assigned | No. in estrus (%) | Days from weaning to estrus |
|-----------------------|--------------|-----------------------|-----------------------------|
| Early weaned | 26 | 11 (42) | 5.0 |
| Control | 14 | 3 (21) | 5.9 |
| PG600® | 12 | 8 (75) ^a | 4.1 ^b |
| Placebo | 13 | 6 (46) | 5.0 |
| Vitamin A | 13 | 5 (39) | 5.4 |
| Conventionally weaned | 27 | 23 (85) ^c | 3.9 |
| Control | 13 | 9 (69) | 4.1 |
| PG600® | 14 | 14 (100) ^a | 3.7 |
| Placebo | 13 | 12 (92) | 3.8 |
| Vitamin A | 14 | 11 (79) | 3.9 |

^aMore ($P < .025$) than for control early-weaned sows.

^bLess ($P < .05$) than for control early-weaned sows.

^cMore ($P < .005$) than for early-weaned sows.

Table 2. Ovulation Rate and Embryonic Survival of Early-Weaned and Conventionally Weaned Sows

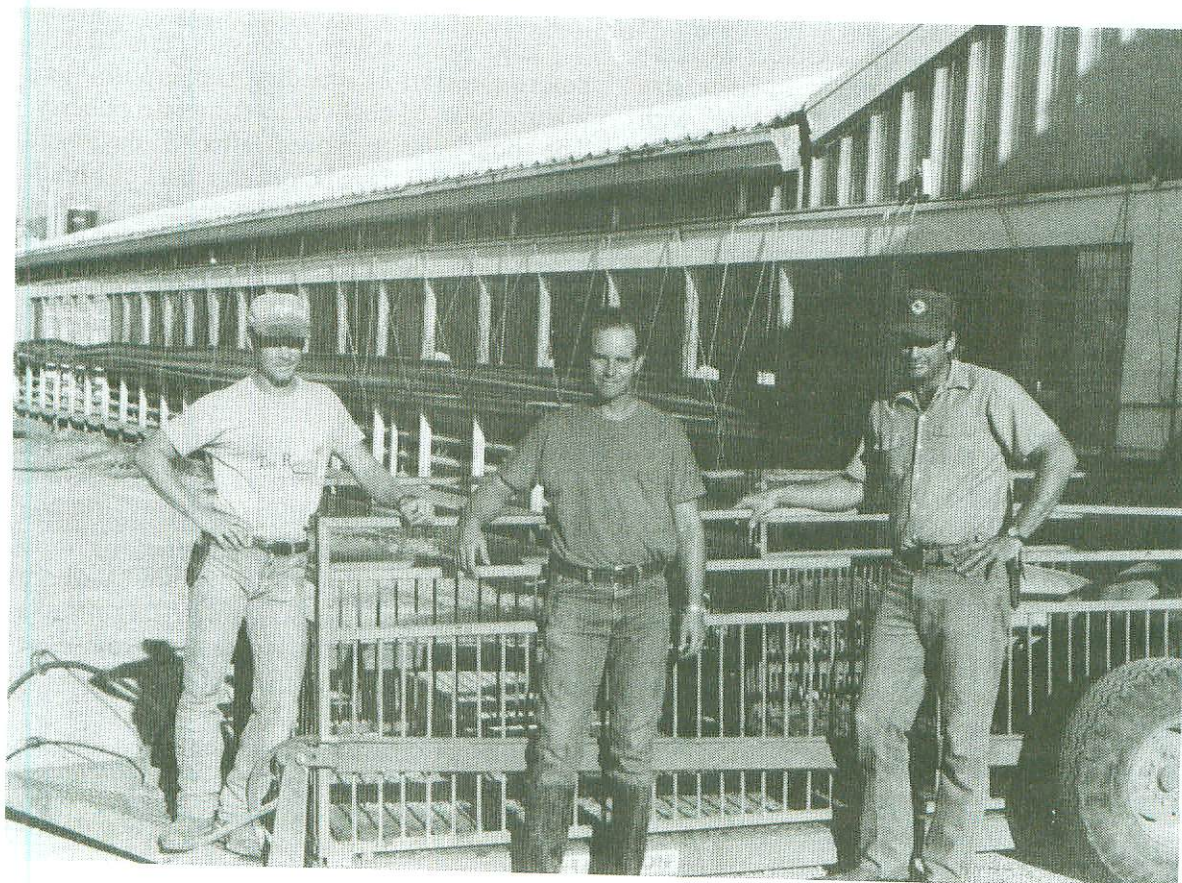
| Treatment | No. | Ovulation rate | Embryos recovered | Embryo survival, % |
|-----------------------|-----|-------------------|-------------------|--------------------|
| Control | 12 | 17.7 | 10.9 | 69 |
| PG600® | 22 | 22.2 | 16.4 ^a | 75 |
| Placebo | 18 | 20.4 | 10.8 | 66 |
| Vitamin A | 17 | 20.9 | 16.5 ^b | 78 ^d |
| Early weaned | 11 | 15.9 | 9.9 | 73 |
| Conventionally weaned | 23 | 24.0 ^c | 17.4 ^c | 71 |

^aMore ($P = .05$) than control.

^bMore ($P < .05$) than placebo.

^cMore ($P < .05$) than early-weaned.

^dTends ($P = .10$) to be more than placebo.



KSU Swine Teaching and Research Center Farm Crew (Left to Right), Mark Nelson, Breeding Barn Manager; Joe Carpenter, Herdsman; and Roger Anderson, Farrowing House Manager; (not pictured, Randy Riffel, Finishing Herd Manager).