

Induced estrus and breeding during lactation: Effects on sow and litter performance

Roy N. Kirkwood DVM, PhD; Philip A. Thacker PhD

Summary

Objective: To test the effect of pregnancy concurrent with lactation on piglet growth and sow fertility.

Methods: At 28 days of lactation, sows were either weaned (controls) or treated with 1000 IU pregnant mare serum gonadotropin (PMSG) and then weaned at 42 days of lactation. Sows were bred at the first estrus after weaning or PMSG.

Results: Pregnancy concurrent with lactation did not adversely affect suckling pig performance. The proportion of sows that achieved estrus 7 days after weaning or PMSG treatment, the mean wean-to-estrus interval, and subsequent litter size did not differ between treatments. However, farrowing rate was lower ($P < .01$) for PMSG-treated sows.

Implications: Pregnancy can be achieved concurrent with lactation. However, because of its likely adverse effect on sow fertility, it is not advised for commercial application.

Keywords: sow, lactation, PMSG, estrus, pregnancy

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One method for increasing sow prolificacy (i.e., pigs per sow per year) is to increase litters per year by reducing the interval between farrowing and subsequent conception. Although this objective may be realized by weaning the litter earlier, short lactations are often associated with reduced sow reproductive performance.¹ A potential alternative to earlier weaning is to induce ovulation and conception concurrently with lactation. Estrus and ovulation can be induced during lactation by temporarily separating the sow and litter² and by group-housing lactating sows with boars.³ Unfortunately, the reproductive response to these strategies are variable and unpredictable.

Administering gonadotropins during lactation may induce ovulation more predictably. However, the response varies with the stage of lactation at which the sow is treated. Cole, et al.,⁴ induced ovulation in 96% of sows that received pregnant mare serum gonadotropin

RNK: Alberta Pork Research Centre; Alberta Agriculture, Food and Rural Development, 905 O.S. Longman Building, 6909–116 Street, Edmonton, Alberta, Canada T6H 4P2; email: kirkwood@agric.gov.ab.ca; PAT: Department of Animal and Poultry Science, University of Saskatchewan.

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(PMSG) from 40 days postpartum (PP) but few sows ovulated when injected prior to day 40 PP. Other investigators have confirmed that the stage of lactation affects the ovulatory response to exogenous gonadotropins.^{5–7}

Previous experiments investigating the effects of pregnancy concurrent with lactation have ignored the potential for an extended lactation. However, if pregnancy can be successfully established during lactation without detriment to sow prolificacy or litter performance, it may allow a longer lactation without prolonging the interval between farrowings. If this potential was realized, it could satisfy possible welfare concerns regarding short lactations, while continuing to allow maximum sow performance. The present study was undertaken to investigate the feasibility of inducing pregnancy concurrent with lactation and its effects on the growth of the suckled litter and subsequent sow reproductive performance.

Materials and methods

Fifty-four Yorkshire × Landrace sows of mixed parity were allocated equally by parity, litter size, and litter weight at day 28 of lactation to one of two treatment groups:

- a PMSG group that was induced to ovulate during lactation by an intramuscular (IM) injection of 1000 IU PMSG (Equinex™, Ayerst Laboratories, Montreal, Quebec, Canada). The litters of these sows were weaned at 42 days.
- a control group that received no injection and whose litters were weaned on day 28.

Nutrition

During lactation, the sows were individually housed in 1.5 m × 2.1 m (5 foot × 7 foot) farrowing crates mounted over a raised, perforated floor. The sows were fed ad libitum a barley-wheat-soybean meal diet formulated to provide 13.1 MJ DE per kg and 16% crude protein (CP). Water was available ad libitum.

From 10–42 days of age, piglets were allowed access to a commercial creep feed providing 20% crude protein. For the next 7 days, piglets were fed a mixture (50:50) of creep feed and a commercial starter feed providing 18% crude protein. Thereafter, piglets received just the starter diet. All piglets were weighed weekly from days 28–56 of age, inclusively.

Estrus and ovulation

To facilitate estrus detection, PMSG group sows were removed from their farrowing crates and housed with a boar for 15 minutes per day from 3–7 days after injection. Control sows were housed adjacent to boars after weaning at 28 days of lactation. All sows were bred by natural mating on the day estrus was detected and again 24 hours later. Only sows detected in estrus by 7 days after PMSG injection or weaning were included in the analysis.

A blood sample was obtained by jugular venipuncture from all induced sows 12 days after PMSG injection. Serum from these samples was assayed for concentrations of progesterone using a commercial kit (Intermedico, Markham, Ontario, Canada), as described previously.⁸ Ovulation was judged to have occurred if the progesterone concentration was at least 4.5 ng per mL.

Statistical analysis

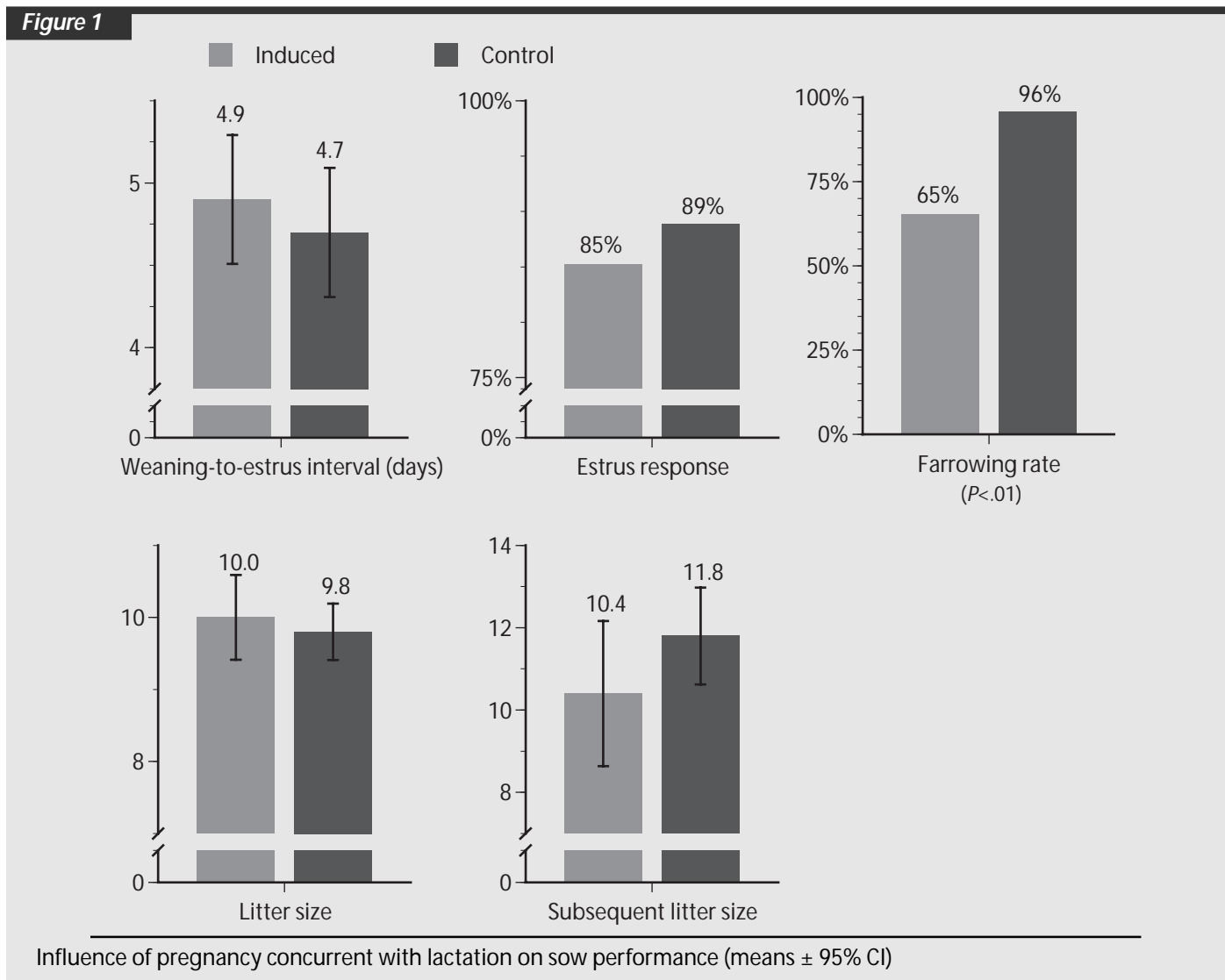
Weaning-to-estrus interval, farrowing rate, and subsequent litter size were all compared between treatment groups in this study. Treatment effects on the percentage of sows bred within 7 days of PMSG injection or weaning, and the percentage of these mated sows subsequently farrowing (farrowing rate), were examined by Fisher's exact test using

the Number Cruncher Statistical System (NCSS 1987; N.J. Hintze, Kaysville, Utah). All other sow data were examined by Student's *t*-test (NCSS 1987). Data for piglet weights were subjected to a repeated-measures ANOVA, and differences at specific weighings were examined by Student's *t*-test (NCSS 1987).

Results

Weaning-to-estrus interval

The proportion of sows bred by 7 days after weaning did not differ between the control and the PMSG groups (Figure 1). Of the 27 control sows, 24 (89%) were detected in estrus and mated by 7 days after weaning. Of the remaining control sows, two were in estrus at 13 days and one at 28 days postweaning. Of the 27 induced sows, 23 (85%) were detected in estrus and mated within 7 days of PMSG injection. However, two of the four nonresponding sows were confirmed as having ovulated, because their serum progesterone concentrations were > 4.5 ng per mL.



Farrowing performance

Of the sows mated by 7 days after PMSG injection or weaning, fewer ($P<.01$) of the induced (65.2%) than control (95.8%) sows farrowed. In the induced sows that were mated but failed to farrow, the interval to the subsequent estrus was variable. The observed intervals from initial mating to remating were 18, 22, 22, 23, 24, 30, and 34 days. In those sows that did farrow, there was no significant effect of treatment on subsequent litter size (Figure 1).

Piglet performance

The growth of the suckled litter to 56 days of age was not adversely affected by concurrent pregnancy (Figure 2). Indeed, mean weights at 35 days of age were greater ($P<.01$) for the suckled than the weaned piglets. However, piglet weekly weight gains from 35–49 days were greater ($P<.05$ to $P<.01$) for controls than for those weaned at 42 days, resulting in similar mean weights at 56 days of age for piglets of both treatment groups (Figure 2).

Discussion

Ovulation

Previous investigators have demonstrated ovulatory responses similar to those we observed in this study in sows given injections of PMSG and human chorionic gonadotrophin (hCG) at a comparable stage of lactation.⁷ However, it is apparent from the present data that a single injection of PMSG at day 28 of lactation, without a subsequent hCG injection, is an effective means of inducing estrus and ovulation in sows.

Farrowing performance

Although ovulation has been induced from 7–15 days PP^{5,8} subsequent pregnancy rates have been uniformly poor.^{5–7} Our observations of lower farrowing rates for PMSG-treated than for control sows suggest that sow fertility is reduced when females are mated after a hormonally induced estrus during lactation. Although the cause of the reduction in fertility is not known, the stage of lactation at which they are mated is important.^{5–7}

In contrast to our observations, previous investigators have observed farrowing rates as high as 80% when sows were induced from 25 days of lactation.^{6,7} However, these authors did not include noninduced control groups and tended to use very few sows. The pregnancy rates observed in the present study suggest that at 28 days PP sows were insufficiently recovered from the suppressive effects of lactation to exhibit acceptable sow reproductive performance. These data suggest that continuing lactation during early gestation may not adversely affect the in utero development of the new litter.

Mating to remating intervals

The variable mating-to-remating intervals we observed in PMSG-treated sows may indicate initial conception with subsequent total embryo loss. Alternatively, it is possible that accessory corpora lutea may have formed a few days after mating due to the long half life of PMSG. Such a situation has been observed in gilts subsequent to PMSG treatment and would account for a prolonged estrous cycle.⁹ Regardless of the cause of the variable length of the estrous cycles, the resultant loss of predictability for nonconceiving sows presents an obstacle to the routine use of gonadotropins for estrus induction during lactation.

Piglet growth

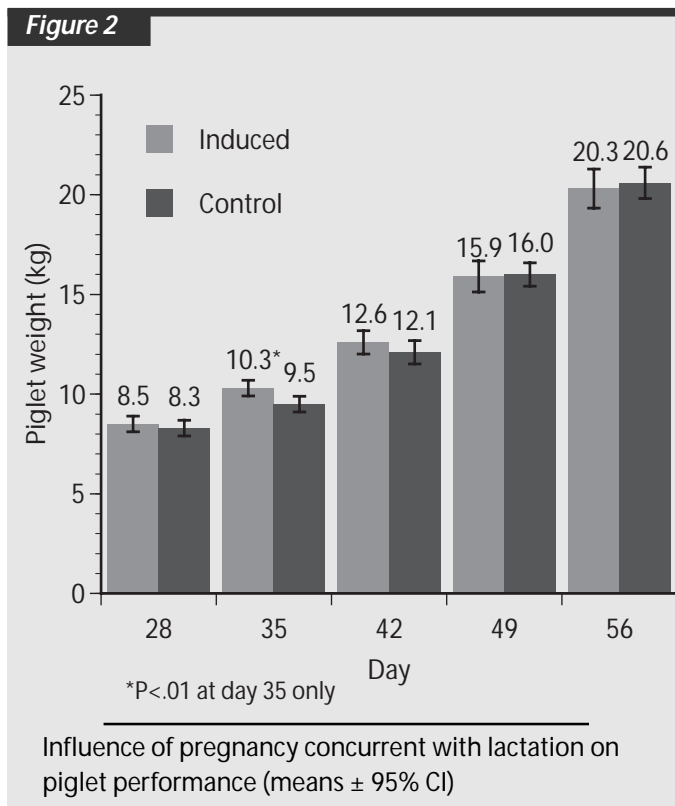
The lower weight gains we observed in suckling piglets from 35–42 days of age may involve pen crowding, but are more likely due to weaned pigs consuming a creep feed that was more nutrient dense and appropriately balanced than sow's milk.

Implications

- Ovulation and subsequent pregnancy can be successfully established in sows after gonadotropin treatment at 28 days of lactation.
- Pregnancy concurrent with lactation did not adversely affect the performance of the suckled litter or the size of the subsequent litter.
- The lower farrowing rate of induced sows and the potential for unpredictable returns to estrus indicate that this protocol is unlikely to be commercially acceptable.

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