ORIGINAL RESEARCH

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Effect of gonadotropin at weaning on reproductive performance of primiparous sows

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Summary

Objective: To determine the effect of administering gonadotropin (Gn) at weaning on the fertility of primiparous sows.

Methods: At weaning, primiparous sows did (n=609), or did not (n=641), receive an injection of 400 IU PMSG plus 200 IU hCG. Sows were bred at their first postweaning estrus. Subsequent farrowing rate and litter size were recorded.

Results: The injection of Gn resulted in a shorter and more synchronous weaning-to-estrus interval ($P<.0001$) and a greater proportion of sows bred by 7 days after weaning ($P<.0001$). There was no effect on farrowing rate, but subsequent litter size was reduced ($P<.02$). However, the number of pigs produced per sow weaned was higher in Gn-treated sows.

Implications: Administering Gn proved to be an effective tool for facilitating the achievement of breeding targets. Although litters may be smaller, this would be offset by increased pig production per sow weaned.

Keywords: sows, weaning, gonadotropin

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An important economic objective for swine producers is to maximize weaned pig output, so that more pigs enter the grow-finish stage of production, reducing unit cost of pigs produced.[1] A recent study of PigCHAMP® data clearly showed that, for most farms, the single greatest factor controlling variance of weaned pig output was the number of females served per week.[1] This analysis highlighted the importance of reducing nonproductive sow days and of achieving breeding targets.

The duration and variability in the weaning-to-estrus interval (WEI) of sows are the two main constraints to achieving breeding targets. Many factors can affect the duration and variability of WEI, including nutrition, season, and parity.[2–4] Primiparous sows are more likely to have problems with prolonged and variable WEIs.[3–5]

Pregnant mare serum gonadotropin (PMSG), either alone or in combination with human chorionic gonadotropin (hCG), has proven efficacious for inducing a fertile estrus in gilts[6,7] and sows,[4,5,8–11] and was not associated with any adverse effect on sow litter size.[8–11] Therefore, the strategic use of gonadotrophins (Gn) may help producers meet breeding targets. The present study was undertaken to evaluate various parameters used to measure fertility in response to the administerion of Gn to primiparous sows at weaning.

Methods

Four commercial units, three in Alberta (herds 1–3) and one in Manitoba (herd 4), cooperated in this study from August–December 1995. A total of 1250 primiparous sows of Yorkshire and Landrace breeding were included in the study. Lactation lengths were:

- 14.1 ± 0.2 days (herd 1),
- 20.1 ± 0.1 days (herd 2),
- 26.3 ± 0.5 days (herd 3) and
- 20.8 ± 0.1 days (herd 4).

All farms were subjectively assessed to have good levels of management, based on the knowledgeability of personnel with regard to nutrition and management of breeding swine and routine achievement of good production results.

All primiparous sows were allocated by first litter size born and weaned to one of two treatment groups:

- One group (Gn-treated) received an intramuscular injection of 400 IU PMSG with 200 IU hCG (PG600®, Intervet Canada, Guelph, Ontario, Canada) on the day of weaning.
- One group served as untreated controls.

Estrus was detected by exposing sows to boars once daily starting at 3 days after weaning. Sows were bred at the time estrus was detected and again 24 hours later. For herd 1, all breedings were by artificial insemination (AI) using semen containing 3×10^9 spermatozoa (Alberta Swine Genetics Inc., Leduc, Alberta). Herds 2 and 4 employed a regime of initial natural service followed by AI (Alberta Swine Genetics Inc.). Herd 3 employed natural service only. For all herds, sires were equally represented on both treatments.

Reproductive parameters measured and recorded were:

- first litter size (total, alive, weaned),

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- lactation length,
- weaning-to-estrus interval (WEI),
- farrowing rate (percent of sows farrowing to initial service), and
- second litter size (total, alive).

For the purposes of data analysis, only sows exhibiting estrus by 25 days after weaning were included, with all other sows being designated as anestrous. This minimized the potential for including sows in the study whose first estrus had been missed and were then bred at their second postweaning estrus.

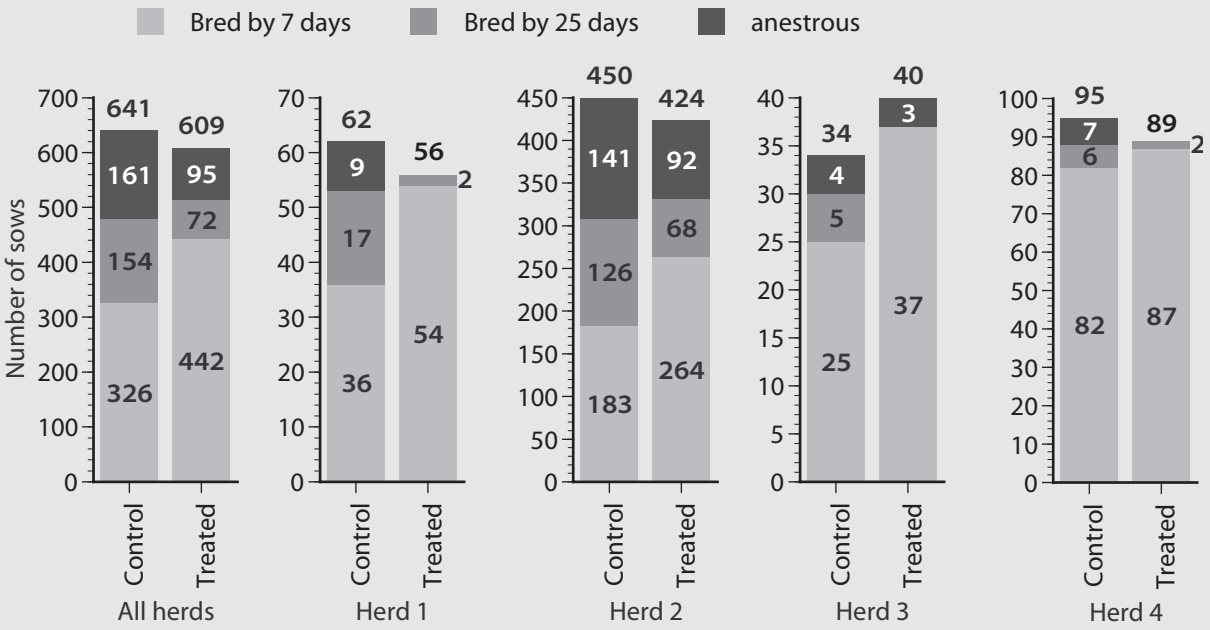
Statistical analysis

We used ANOVA using GLM procedures of SAS®[12] to determine differences in:

- treatment,
- herd, and
- treatment × herd interaction.

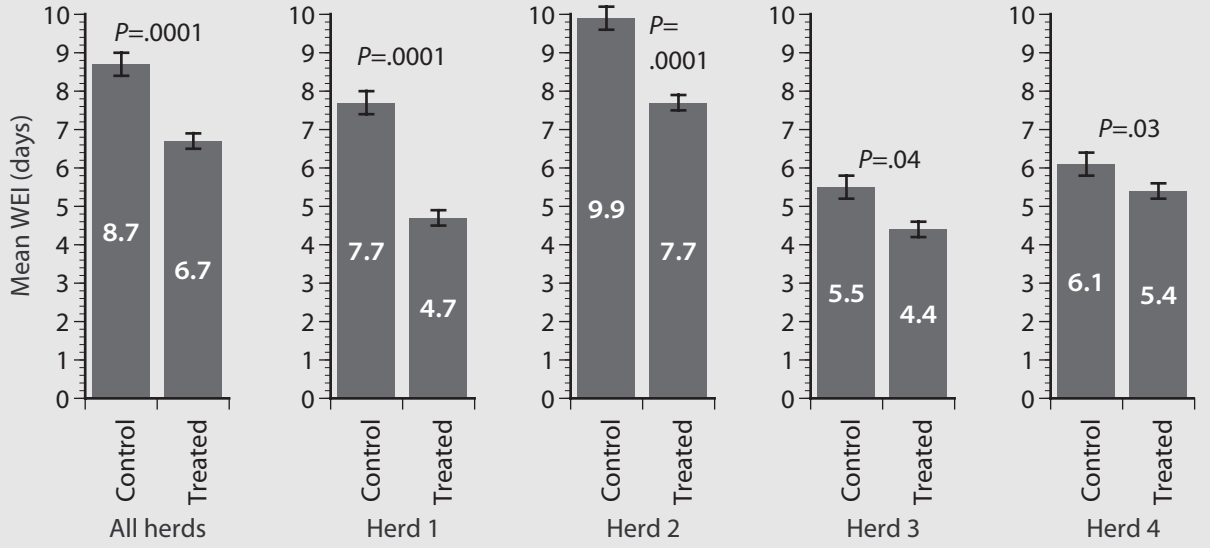
Variances of the means were compared by F-ratio testing and proportional data were compared using χ^2. For herd 2 only (the largest herd), month of weaning was included in the statistical model to investigate the effects of season.

Figure 1



Effect of gonadotropin at weaning on breeding performance of primiparous sows

Figure 2



Effect of gonadotropin at weaning on wean-estrus performance of primiparous sows

Results

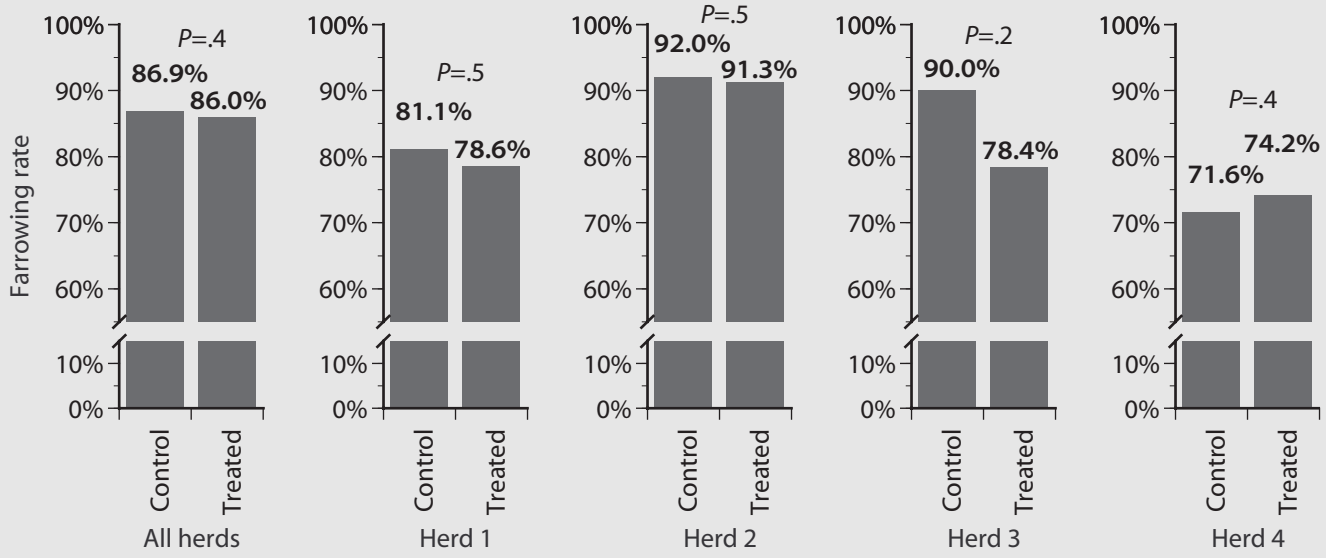
We observed no significant treatment × herd interactions. However, to illustrate the variation in biological responses obtained, individual herd results are presented as well as the overall results (Figures 1–4).

Within herd 2, neither the month of weaning nor the treatment × month interaction were significant. There were no within-herd differences between treatment groups for first litter size (born and weaned) or lactation length.

The percentages of sows bred by 7 days and by 25 days after weaning were significantly increased in Gn-treated groups when data from all herds were pooled (P <.0001) (Figure 1). Within individual herds, there were differences between control and Gn-treated groups: the percentage of sows bred by 7 days after weaning did not differ between the treatments for herd 4 and percentage of sows bred by 25 days after weaning did not differ between treatments for herd 3.

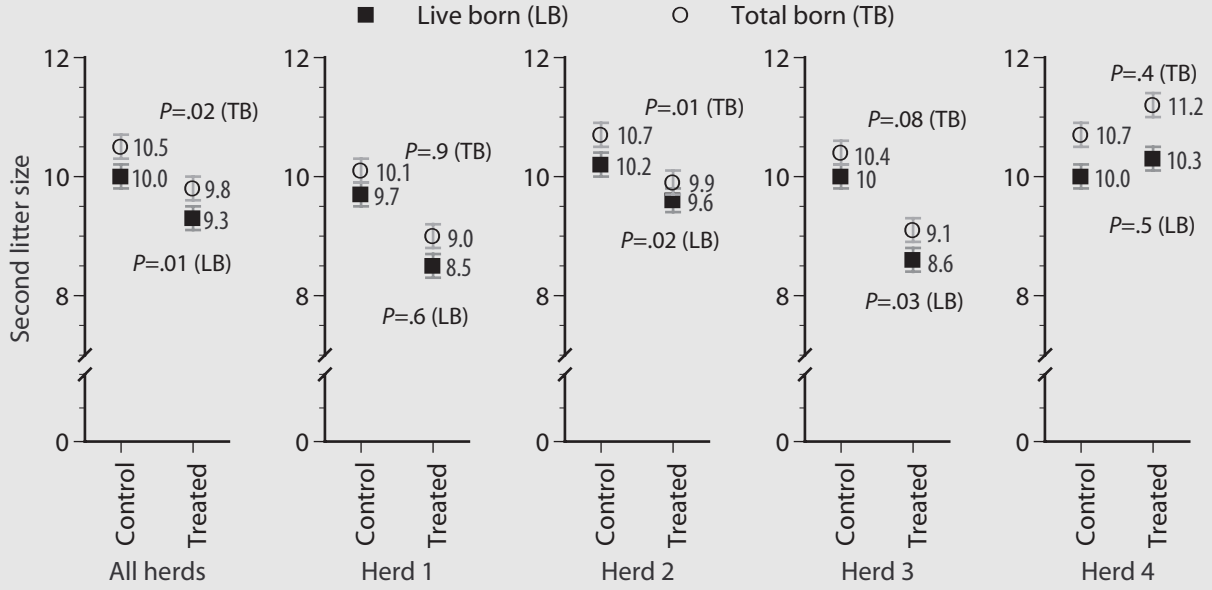
The WEI was shorter and less variable (P <.0001) in the Gn-treated group (Figure 1), an effect that was evident in all herds. Farrowing rate did not differ between treatments either overall or in individual herds, although a notable but nonsignificant depression in farrowing rate was

Figure 3



Effect of gonadotropin at weaning on farrowing rate of primiparous sows

Figure 4



Effect of gonadotropin at weaning on second litter size of primiparous sows

evident for the Gn-treated group in herd 3 (Figure 1). Subsequent litter size was smaller ($P < .02$) in Gn-treated groups in all herds except herd 4 (Figure 4). Although a statistical comparison wasn't possible, pigs produced per weaned sow was increased in Gn-treated groups in all herds except herd 3. This effect was largely eroded when sows bred by 25 days after weaning were included in the calculation.

Discussion

The results of this study suggest that administering Gn to sows at weaning can help producers achieve herd breeding targets, with 20% more Gn-treated than control sows being bred by 7 days after weaning. Further, the returns to estrus for the Gn-treated group were more prompt and synchronous. Administering Gn can enhance the predictability in breeding management of primiparous sows, the component of the sow herd that has traditionally been the greatest problem.

In this study, there was no overall effect of treatment on farrowing rates, but farrowing rate in herd 3 tended to be reduced (by 12%) in the Gn-treated group compared to controls. The biological significance of this is uncertain since this herd supplied relatively few animals to the study.

Gonadotropin treatment was associated with a significant reduction in subsequent litter size. This contrasts with earlier studies that have noted either no effect on litter size[8,9] or an increase in litter size.[10,11] The reason for smaller subsequent litters in the present study is not known. Litter size is a function of the number of ova shed (ovulation rate) and subsequent embryo survival. However, it is not possible from the present data to determine which of these two components was involved in reduced litter sizes.

To provide a simple comparison of sow productivity between treatments, pigs produced per weaned sow (percentage of sows bred by 7 days × farrowing rate × litter size) was calculated (Figure 5). We realize that this value is a reflection of the 7-day cut-off rather than final pig production and is not meant to imply that Gn administration will increase overall pig production. Rather, it is an attempt to build in a predictability component to pig production.

We suggest that the longer WEI of primiparous sows allows a longer recovery period after the metabolic stress of lactation and its effect is similar to delaying breeding to the second postweaning estrus to allow a recovery in fertility. Gonadotropin treatment acts to override this delay in estrus onset and, therefore, may allow the breeding of some sows that are relatively less fertile. However, in our study, this effect was offset by the fact that these animals were successfully bred and so contributed to the production of potential weaner pigs, as calculated by pigs produced per sow weaned.

Implications

- Administering Gn to primiparous sows at weaning resulted in more sows being bred and earlier, and more synchronous breedings.
- Gonadotropins are a useful management tool for herds in which it is important to achieve breeding targets.

Acknowledgements

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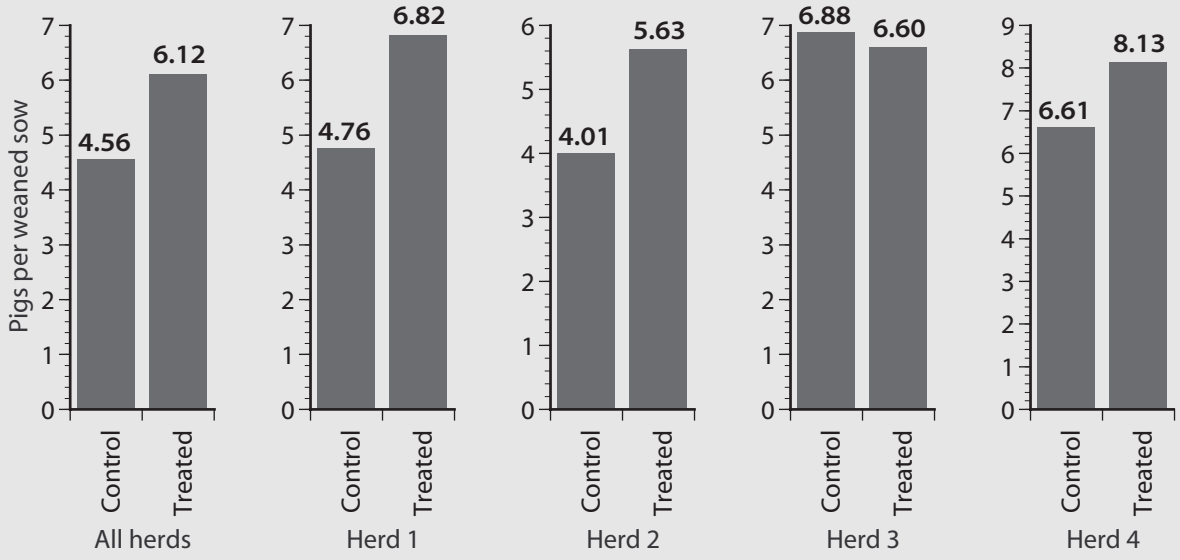
Figure 5



Effect of gonadotropin at weaning on pigs produced per primiparous sow weaned. This value is the product of percent bred by 7 days, farrowing rate to first service, and total pigs born from that service.

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