Induction of Estrus in Prepuberal Gilts by Treatment with a Combination (P.G. 600®) of Pregnant Mare's Serum Gonadotropin and Human Chorionic Gonadotropin

Technical Report No. 5

Introduction

Efficiency of management of reproduction in swine herds would be enhanced if there were effective, approved methods for inducing estrus in gilts for their introduction into the breeding herd.

Currently, producers select more gilts than are needed for replacements, and then only breed those gilts that show estrus during a specified breeding period on the farm. Gilts that do not fit the farm's schedule are subsequently sold at a lower price because they exceed the desired market weight after spending several weeks in a breeding pen without being mated.

If estrus could be induced at a reasonably predictable time after movement of gilts from finishing facilities to the breeding unit, then producers would need to select fewer replacement gilts and these gilts could be scheduled to fit into a specified breeding group on the farm.

Previous studies on induction of estrus in gilts have utilized several approaches including the injection of Pregnant Mare's Serum Gonadotropin (PMSG) alone or PMSG followed 48 to 96 hours later by an injection of Human Chorionic Gonadotropin (HCG). Most prior studies have used rather high doses of these hormones, and often the ovulatory responses have been unpredictable — ranging from a normal ovulation rate to super-ovulation. The latter is undesirable, because it leads to reduced fertility.

Studies on the endocrinology of follicular growth in pigs have revealed that follicle stimulating hormone (FSH) and luteinizing hormone (LH) act in concert to regulate the final stages of follicular development leading to ovulation. Since PMSG has biological properties similar to those of FSH, and HCG has properties similar to LH, it is physiologically appropriate to use these in combination to stimulate follicular growth in prepuberal gilts. The action of the two gonadotropins in combination is synergistlc. so the dose can be lower than when the two are used separately. The trials described herein were conducted to evaluate the effectiveness of P.G.600®, a combination of 400 IU of PMSG plus 200 IU of HCG, for induction of estrus in gilts on commercial farms. The trials were conducted between the fall of 1984 and the fall of 1985 and utilized 678 gilts on 10 farms in three states.

Materials and Methods

Commercial swine units in central Illinois, central Missouri and eastern North Carolina were selected for the study on the basis of their willingness to adhere to the FDA-approved experimental protocol. These units were all intensely managed operations and all or most of the animals on each farm were housed in total confinement. The units ranged in size from 150 to 1,000 sows.

On each farm, market-weight crossbred gilts were assigned to be injected with P.G.600® or to serve as controls. The lyophilized P.G.600® solution was diluted immediately prior to use and was injected subcutaneously into the neck on the day gilts were moved from finishing buildings to breeding units. Gilts assigned to the control group were not injected. The number of gilts treated with P.G.600® ranged from 20 to 96 among the 10 farms, and a similar number of controls was randomly selected on each farm.

Gilts were checked for heat with mature boars at least once daily for at least 28 days after treatment. Gilts in heat were mated naturally once daily during estrus. A common data collection form was used on all farms. Dates of treatment, estrus, mating, return to estrus, farrowing and weaning were recorded for each gilt. In addition, service boar ID, number and livability of pigs farrowed, litter weaning weights and rebreeding performance after weaning the first litter were recorded for gilts that were in estrus within 28 days of treatment.

Data was analyzed by least squares analyses of variance for a randomized complete-block design, and the statistical model included treatment, farm, and the treatment by farm interaction as sources of variation. The effect of treatment (P.G.600® vs. control) on dependent variables such as percentage in estrus, days to estrus, etc. was tested statistically by using the treatment by farm mean square.

Results and Discussion

Treatment of gilts with P.G.600® significantly improved several measures of reproductive performance (Table 1). Within 28 days of treatment, 72.9% of the gilts treated with P.G.600® had been detected in heat compared with 59.5% of the nontreated gilts. This response was consistent across farms. For example, percentage of P.G.600®-treated gilts in estrus within 28 days exceeded that of the control gilts on seven farms, was equal to that of control gilts on two farms and was less than that of controls on only one farm. Among farms, percentage of P.G.600®-treated gilts in estrus within 28 days ranges from 4-2 to 97% compared with 31 to 90% for controls.

Number of days from treatment to onset of estrus was lower for gilts treated with P.G.600® than for controls (7.5 vs. 10.4) and the consistency of response was such that P.G.600®-treated gilts had shorter intervals to estrus on seven farms, had intervals similar to controls on one farm and had intervals longer than controls on only two farms. Among the ten farms, days from treatment to estrus ranged from 3.9 to 12.1 for gilts treated with P.G.600® compared with 4.6 to 17.5 for controls.

P.G. 600®

Table 1.

Reproductive Performance of Gilts treated with P.G. 600®

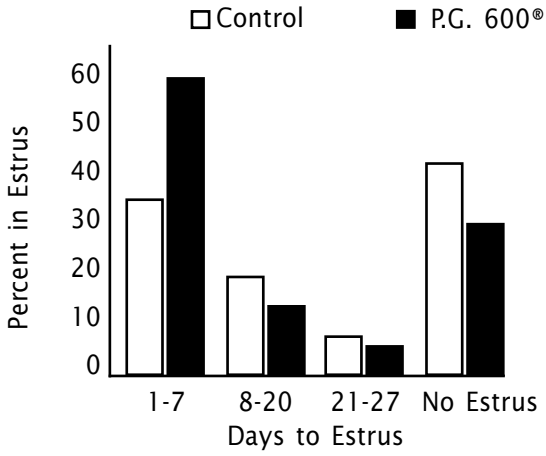
Reproductive trait	Control	P.G. 600®
Percentage in estrus within 28 days	59.5	72.9*
Number os days from treatment to estrus	10.4	7.5*
Percentage of gilts farrowing after mating	78.9	78.1
Live pigs per litter	8.6	8.6
Dead pigs per litter	0.3	0.2
Mummified pigs per litter	0.03	0.02
Number of pigs weaned per litter	8.1	7.8

*Different from mean for control group ($P < 0.05$)

The distribution of heats for gilts detected in heat within 28 days after treatment are illustrated in Figure 1. Of gilts detected in heat within 28 days after treatment, more P.G.600®-treated gilts showed heat within 7 days then did controls. There were no differences in percentages detected in heat between 8 and 20 days or between 21 and 27 days, indicating the P.G.600® did not cause an increase in silent heats. More controls were not detected in heat within 28 days after treatment.

Figure 1.

Percentage of Gilts Detected in Heat within 28 Days after Treatment.



The degree of estrus synchronization was estimated by calculation of the within-treatment variance for days to heat. The variance was 50.7 days for controls compared with 39.0 days for gilts treated with P.G.600®, indicating a better synchrony for gilts treated with P.G.600®. The percentage of gilts that returned to estrus did not differ between groups, and averaged 12.8% for controls compared with 16.4% for those injected with P.G.600®. Thus treatment with P.G.600® did not affect conception rate or return interval.

Percentage of gilts that farrowed after mating did not differ between the two groups (78.9 vs. 78.1 for controls and P.G.600®, respectively). Among nine farms with farrowing data, the farrowing rate was similar between groups on six farms, was greater for the controls on two farms and was greater for gilts given P.G.600® on one farm. Among farms, farrowing rates ranged from 55 to 97% for gilts treated with P.G.600® compared with 50 to 100% for controls.

Litter traits were not different among the treatment groups. The number of pigs born live, the number born dead and the number mummified was similar Among farms, number born live ranged from 7.1 to 9.5 for gilts given P.G.600® compared with 7.3 to 8.9 for controls. On one farm, number of live pigs from gilts treated with P.G.600® exceeded that of controls by 2.2 pigs per litter, while on another this difference was 1.3 pigs per litter. On three farms, the number of live pigs per litter from control gilts exceeded that of P.G.600®-treated gilts by 1.0 to 1.5 pigs. The number of pigs weaned per litter did not differ significantly between treatment groups. Pigs were cross-fostered within treatment groups to determine if treatment with P.G.600® had any effect on number weaned. On two farms, the number weaned by control gilts exceeded that of gilts given P.G.600® by 1.3 to 1.6 pigs per litter, but on two farms gilts given P.G.600® weaned 0.6 to 0.7 more pigs per litter than controls. On one farm, litter weights were recorded at 21 days of lactation. Litters from gilts given P.G.600® averaged 82.9 lbs. (37.8 kg) compared with 79.4 lbs. (36.1 kg) for controls. The number of days from weaning the first litter to onset of estrus was recorded on three farms. Gilts treated with P.G.600® returned to estrus in 9.6 days compared with 20.6 days for controls. While this difference was not statistically different ($P < 0.14$), it illustrates that treatment with P.G.600® did not have an adverse effecton rebreeding performance of first-litter sows.

Summary

Treatment of market-weight gilts with P.G.600® increased percentage in estrus within 28 days compared with values for non-treated herdmates. The greatest difference in response occurred within the first 7 days after treatment. Farrowing rates and litter traits did not differ between gilts given P.G.600® and controls. The use of P.G.600® for induction of estrus in gilts should provide a means for improving reproductive efficiency in swine herds.

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