Performance of Gilts Bred at Various Ages Following Estrus Induction

Summary
Data from 312 gilts bred at ages ranging from 24 to 40 weeks were studied to examine the effects of age at breeding on litter and sow traits following estrus induction. Gilts were administered 400 I.U. pregnant mare serum gonadotropin (PMSG) plus 200 I.U. human chorionic gonadotropin (HCG) while being simultaneously moved, mixed and exposed to boars to stimulate first estrus. Approximately 80 percent of gilts responded to synchronization and were bred. Of those gilts that conceived, total pigs born, pigs born alive, and birth weights increased as gilts were bred at older ages. Gilts bred at 24 to 26 weeks of age had about 1.2 fewer total pigs born and 1.3 fewer pigs born alive than those bred at 30 or more weeks of age. No significant difference existed for age at first breeding on days weaning to cycling, number born, number born alive or litter birth weight.

Results from this study show that gilts can be bred successfully as young as 6 months of age. However, the reduced litter size from young gilts should be balanced against the advantages of reduced gilt pool numbers, better synchronization and less days in the breeding herd to determine its feasibility for each swine herd.

Introduction
Records from commercial swine herds show an annual culling rate of 30 to 40 percent. Thus, pork producers must continually add a sizeable number of gilts to the breeding herd. These gilts usually cause a great loss in breeding herd efficiency due to their lower conception rate, reduced expression of estrus, lack of heat, poor timing of heat and a litter size of 1.2 pigs per litter fewer than three to six parity sows. As herds become larger and more confinement oriented, these problems seem to become magnified as a result of confinement breeding. Many herds must maintain a large gilt pool (three times the number to be bred) in order to get adequate numbers in heat so that they fit into scheduled breeding groups.

Procedures
This study utilized several proven methods to induce cycling in gilts. Since there can be as many as 90 percent of the gilts in a confinement finishing facility that do not cycle up to an age of about 7 months, these gilts are good candidates for induction of first heat. Boar exposure, mixing and moving of gilts have been shown to be factors contributing to gilt cycling. In this study, gilts were raised in a confinement finishing facility until reaching the age of 6 to 8 months of age. The gilts were then simultaneously moved, moved to the breeding area and exposed to boars. In addition, gilts were injected intramuscularly with a mixture of 400 I.U. of PMSG and 200 I.U. of HCG. This study was done at a large commercial swine farm. Gilts were bred on the first heat following treatment to farrow at ages ranging from about 10 to 12 months of age. The objective of the study was to compare performance of gilts bred at 6 to 6.5 months of age with those bred at an older age after PMSG and HCG treatment.

Caution: Treatment will not induce estrus in gilts that have already reached puberty (begun to cycle). Gilts that are less than five and one-half months of age or that weigh less than 85 kg (187 lb.) may not be mature enough to continue normal estrus cycles or maintain a normal pregnancy to full term after treatment. Treatment will not induce estrus in sows that are returning to estrus normally three to seven days after weaning. Delayed return to estrus is most prevalent after the first litter; the effectiveness of P.G. 600 has not been established after later litters. Delayed return to estrus often occurs during periods of adverse environmental conditions, and sows mated under such conditions may farrow smaller than normal litters.

For complete safety information on P.G. 600 use, see accompanying product package insert.
Results and Discussion

Performance results of the induced first litter gilts are shown in Table 1. Eighty percent of treated gilts cycled and were bred. The majority of the gilts cycled four to seven days after treatment.

Data from 312 gilts bred at an age of 24 to 40 weeks was analyzed to determine the effects of age at first breeding on reproductive performance. Gilts bred at 24 to 26 weeks of age had about 1.2 fewer total pigs born and about 1.3 fewer pigs born alive than gilts bred at 30 or more weeks of age. There was a significant linear age effect for number born, number born alive and litter birth weight indicating that gilts perform better as they are bred at an older age. The quadratic effect of age on these traits was not highly significant but indicates that gilts reach a plateau for total number of pigs born and pigs born alive at about 30 weeks of age. Thus, the producer would have to accept smaller litter sizes as the trade off for getting gilts bred and into the herd at younger ages. However, breeding gilts at younger ages would increase feed savings, reduce the need to maintain a large gilt pool, and provide better scheduling of farrowings.

Another important objective of this study was to determine the rebreeding ability and future sow productivity of gilts bred at young ages. Table 2 shows the reproductive performance of these sows for their second litter.

No significant difference existed for the effect of age at first breeding on days from weaning to cycling, number born, number born alive or litter birth weight for these sows on their second litter. Thus, the detrimental effects on litter size from breeding gilts at a young age do not hold true for second litter performance. Furthermore, ability of sows to cycle postweaning was not a problem. Perhaps the gilts had additional time during lactation and during the second pregnancy to add to body reserves and prepare for their second litters.

This study shows that gilts can be successfully bred at a young age. The feasibility of this management practice for the pork producer is related to the economic comparison between maintaining a gilt pool with approximately three times the number needed vs. inducing and breeding young gilts at first heat after reaching 6 months of age.

### Table 1. Reproductive Performance of First Litter Gilts Induced to Cycle at 24 to 40 Weeks of Age

<table>
<thead>
<tr>
<th>Age (Weeks)</th>
<th>Number</th>
<th>Number Born</th>
<th>Number Born Alive</th>
<th>Birth Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>24–26</td>
<td>39</td>
<td>7.77</td>
<td>7.13</td>
<td>20.7</td>
</tr>
<tr>
<td>27–29</td>
<td>110</td>
<td>7.95</td>
<td>7.71</td>
<td>22.3</td>
</tr>
<tr>
<td>30–32</td>
<td>87</td>
<td>8.97</td>
<td>8.45</td>
<td>23.5</td>
</tr>
<tr>
<td>33–35</td>
<td>39</td>
<td>8.84</td>
<td>8.19</td>
<td>23.7</td>
</tr>
<tr>
<td>&gt; 36</td>
<td>43</td>
<td>8.98</td>
<td>8.56</td>
<td>25.6</td>
</tr>
</tbody>
</table>

*Linear effect (P < 0.01)
*Quadratic effect (P < 0.10)

### Table 2. Reproductive Performance of Sows During their Second Parity when Induced to Cycle at Various Ages at First Mating

<table>
<thead>
<tr>
<th>Age at First Breeding (Weeks)</th>
<th>Weaning to Breeding Interval</th>
<th>Number Born</th>
<th>Number Born Alive</th>
<th>Birth Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>24–26</td>
<td>12.1</td>
<td>9.00</td>
<td>8.90</td>
<td>29.3</td>
</tr>
<tr>
<td>27–29</td>
<td>13.7</td>
<td>8.72</td>
<td>8.46</td>
<td>27.0</td>
</tr>
<tr>
<td>30–32</td>
<td>12.1</td>
<td>9.33</td>
<td>8.90</td>
<td>27.1</td>
</tr>
<tr>
<td>33–35</td>
<td>12.3</td>
<td>10.40</td>
<td>10.00</td>
<td>32.4</td>
</tr>
<tr>
<td>&gt; 36</td>
<td>11.2</td>
<td>8.87</td>
<td>8.61</td>
<td>27.1</td>
</tr>
</tbody>
</table>
The costs appear to be in favor of the gilts bred at a young age. However, since more gestation feed will be required for the young gilts, the two programs probably are near equal in cost or returns. Producers should balance the returns from a larger litter size with the older gilts against the more effective use of facilities, better scheduling and lowered labor requirements for heat checking with using PMSG and HCG to induce cycling in young gilts. The unanswered question related to this management practice is that of sow longevity. However, this study shows the breeding of young gilts via hormone administration is an effective way of programming gilt breedings and for eliminating the large gilt pool often needed to find cycling females to fit into breeding groups.

<table>
<thead>
<tr>
<th>Alternative 1</th>
<th>Alternative 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Gilt pool maintained 60 days.)</td>
<td>(Hormone induced estrus and bred at 6 months.)</td>
</tr>
<tr>
<td>Feed, labor, overhead @ $0.80/day</td>
<td>Feed, labor, overhead @ $0.80/day</td>
</tr>
<tr>
<td>60 days cost = $48.00</td>
<td>10 days cost = $8.00</td>
</tr>
<tr>
<td>Returns if 1.3 extra pigs = $20.00</td>
<td>Hormones = $4.00</td>
</tr>
<tr>
<td>Cost = $18.00</td>
<td>Cost = $12.00</td>
</tr>
</tbody>
</table>

**Merck Animal Health**  
**Technical Report No. 10**  
Performance of Gilts Bred at Various Ages Following Estrus Induction  
Author: Gene A. Isler.
DESCRIPTION:
Gilts normally reach puberty (begin experiencing normal estrous cycles and exhibiting regular estrus or heat) at any time between six and eight months of age, although some gilts will not have exhibited their first estrus at ten months of age. Age at first estrus is influenced by several factors including breed type, season of the year, environmental conditions, and management practice (Hurtgen, 1986). Sows normally exhibit estrus three to seven days after weaning their litters; however, some otherwise healthy sows may not exhibit estrus for 30 days or more after weaning (Dial and Britt, 1986).

The causes of delayed return to estrus in healthy sows are poorly understood, but probably include season of the year (so-called seasonal anestrus; Hurtgen, 1979), adverse environmental conditions, such as high ambient temperatures (Love, 1978), and the number of previous litters, because the condition is more prevalent after the first litter than after later litters (Hurtgen, 1986).

P.G. 600 is a combination of serum gonadotropin (Pregnant Mare Serum Gonadotropin or PMSG) and chorionic gonadotropin (Human Chorionic Gonadotropin or HCG) for use in prepuberal gilts (gilts that have not yet exhibited their first estrus) and in sows at weaning. It is supplied in frozen dried form with sterile diluent for reconstitution.

In gilts and sows, the action of serum gonadotropin is similar to the action of Follicle-Stimulating Hormone (FSH), which is produced by the animals’ anterior pituitary gland. It stimulates the release of mature ova from the follicles of the ovaries (ova, eggs) and promotes the outward signs of estrus (heat).

The action of chorionic gonadotropin in gilts and sows is similar to the action of Luteinizing Hormone (LH), which is also produced by the animals’ anterior pituitary gland. It causes the release of mature ova from the follicles of the ovaries (ovulation), and it promotes the formation of corpora lutea, which are necessary for the maintenance of pregnancy once the animals have become pregnant.

The combination of serum gonadotropin and chorionic gonadotropin in P.G. 600 induces fertile estrus in most prepuberal gilts and weaned sows three to seven days after administration (Schilling and Cerne, 1972; Britt et al., 1986; Bates et al., 1991). The animals may then be mated or, in the case of gilts, mating may be delayed until the second estrus after treatment.

NOTE: P.G. 600 IS INTENDED AS A MANAGEMENT TOOL TO IMPROVE REPRODUCTIVE EFFICIENCY IN SWINE PRODUCTION OPERATIONS. TO OBTAIN MAXIMUM BENEFIT FROM THIS PRODUCT, ESTRUS DETECTION AND OTHER ASPECTS OF REPRODUCTIVE MANAGEMENT MUST BE ADEQUATE. IF YOU ARE IN DOUBT ABOUT THE ADEQUACY OF YOUR BREEDING PROGRAM, CONSULT YOUR VETERINARIAN.

P.G. 600 is available in two package sizes:

SINGLE DOSE VIALS (order Code No. PG-720-1) - Five vials containing white freeze-dried powder, plus five vials containing sterile diluent. When reconstituted, each single dose vial (5 mL) of P.G. 600 contains:

- SERUM GONADOTROPIN (PMSG) 400 IU
- CHORIONIC GONADOTROPIN (HCG) 200 IU
  (equivalent to 200 USP Units chorionic gonadotropin)

FIIVE DOSE VIALS (order Code No. PG-720-5) - One vial containing white freeze-dried powder, and one vial containing sterile diluent. When reconstituted, the five dose vial (25 mL) of P.G. 600 contains:

- SERUM GONADOTROPIN (PMSG) 2000 IU
- CHORIONIC GONADOTROPIN (HCG) 1000 IU
  (equivalent to 1000 USP Units chorionic gonadotropin)

INDICATIONS FOR USE:
PREPUBERAL GILTS: P.G. 600 is indicated for induction of fertile estrus (heat) in healthy prepuberal (non-cycling) gilts over five and one-half months of age and weighing at least 85 kg (187 lb.) may not be mature enough to continue normal estrus cycles or maintain a normal pregnancy to full term after treatment.

TREATMENT will not induce estrus in sows that are returning to estrus normally three to seven days after weaning. Delayed return to estrus is most prevalent after the first litter; the effectiveness of P.G. 600 has not been established after later litters. Delayed return to estrus often occurs during periods of adverse environmental conditions, and sows mated under such conditions may farrow smaller than normal litters.

DOSAGE AND ADMINISTRATION:
One dose (5 mL) of reconstituted P.G. 600, containing 400 IU serum gonadotropin (PMSG) and 200 IU chorionic gonadotropin (HCG), should be injected into the gilt or sow’s neck behind the ear.

Prepuberal gilts should be injected when they are selected for addition to the breeding herd. Sows should be injected at weaning during periods of delayed return to estrus.

DIRECTIONS FOR USE:
SINGLE DOSE VIALS: Using a sterile syringe and a sterile 0.90 x 38 mm (20 G x 1½”) hypodermic needle, transfer the contents of one vial of sterile diluent (5 mL) into one vial of freeze-dried powder. Shake gently to dissolve the powder. Inject the contents of the vial into the gilt or sow’s neck behind the ear.

FIVE DOSE VIAL: Using a sterile syringe and a sterile 0.90 x 38 mm (20 G x 1½”) hypodermic needle, transfer approximately 5 mL of the sterile diluent into the vial of freeze-dried powder. Shake gently to dissolve the powder. Transfer the dissolved product back into the vial of diluent and shake gently to mix. Inject one dose (5 mL) of the reconstituted solution into the gilt or sow’s neck behind the ear.

STORAGE PRECAUTIONS:
Store at 36-46°F (2-8°C).

Once reconstituted, P.G. 600 should be used immediately. Unused solution should be disposed of properly and not stored for future use.

Spent hypodermic needles and syringes generated as a result of the use of this product must be disposed of properly in accordance with all applicable Federal, State and local regulations.

REFERENCES:
Reproductive performance of sows treated with a combination of Pregnant Mare’s Serum Gonadotropin and Human Chorionic Gonadotropin at weaning in the summer. Journal of Animal Science 69: 894.


Definition of a seasonal infertility problem in pigs. Veterinary Record 103: 443.

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READ AND FOLLOW LABEL DIRECTIONS
NADA No. 140-856; APPROVED BY FDA FOR ANIMAL USE ONLY