Increasing Reproductive Efficiency of Gilts Managed in Confinement


Story in Brief

Sixty-two Yorkshire gilts were used to determine if the absence of estrus in gilts reared in confinement is caused by decreased ovarian response to gonadotropins. Gilts were reared in confinement on concrete floors until 130 days of age then confined in concrete slotted floor pens (8 x 12 ft, eight gilts per pen) or outside lots (60 x 100 ft) until 240 days of age. Gilts were observed daily for estrus starting at 160 days of age. Twenty-four percent of the outside gilts and 18 percent of the confinement gilts exhibited estrus by 210 days of age.

Thirty-two confinement gilts that had not exhibited estrus or ovarian activity by 210 days of age were randomly allotted to treatments: I-Control, II-750 IU PMSG, III-750 IU PMSG and 100 μg GnRH four days later or IV-250 μg estradiol. Percentages of confinement gilts in estrus within six days after treatment were 25.0, 75.0, 87.5 and 0 percent for treatments I thru IV, respectively. Days from treatment to estrus for gilts that responded to treatment were 4.0 ± 1.0, 3.3 ± 0.3 and 4.1 ± 0.3 days for treatments I, II and III, respectively. These data indicate that anestrous gilts in confinement lack cyclic ovarian function but can respond to PMSG treatment with estrus and ovulation.

Introduction

Intensification of swine production has increased the total efficiency of pork production. Confinement, either partial or complete, is an integral part of intensification. The breeding herd is the last phase of modern production systems to move into confinement. With the construction of total cycle confinement systems, reports of reduced reproductive efficiency of gilts and sows have been widespread. Symptoms reported have included delayed puberty, unwillingness to mate and shortened or lengthened expression of estrus. The net result of these problems has been decreased conception rates, reduced reproductive performance and increased production costs.

This experiment was conducted to determine if delayed puberty associated with total confinement of gilts is caused by altered ovarian response to gonadotropic hormones and to develop hormonal therapy that could be used to initiate puberty in anestrus gilts in confinement.

Experimental Procedure

All gilts were reared in confinement on concrete floors until 130 days of age at the South Swine Barn in Stillwater. Gilts were then confined in concrete slotted floor pens (8 x 12 ft, eight gilts per pen) or outside lots (60 x 100 ft) until 240 days of age. Starting
at 160 days of age, gilts were checked for estrus daily using a boar. The boars used for
estrus detection were alternated between confinement housing and outside lots every
two weeks.

Inside anestrous gilts were randomly allotted to one of four treatments at 210 days
of age: I-Control, II-750 IU PMSG, III-750 IU PMSG and 100 μg GnRH four days
later or IV-250 μg estradiol. Anestrous gilts were treated during a 10-week period
starting in July.

Blood samples were obtained via puncture of the vena cava one week prior to
treatment and on the day of treatment. Plasma progesterone was quantified in these
samples by radioimmunoassay. The blood progesterone concentrations were used to
select anestrous gilts that lacked ovarian activity as well as behavioral estrus. Gilts that
exhibited estrus after treatment were inseminated each day of estrus. At 40 days after
treatment, the gilts were slaughtered and the numbers of embryos and corpora lutea
were determined.

**Results and Discussion**

Twenty-four percent of the outside gilts and 18 percent of the confined gilts
exhibited estrus by 210 days of age. Gilts born during November and December (fall)
and maintained outside had a higher incidence of estrus before 210 days of age than
gilts born during February and March (spring) (62 percent vs 0 percent respectively,
Table 1). The fall born gilts maintained outside were also lighter at 210 days of age than
the spring born gilts. Confinement gilts born during the fall and spring had similar
body weights and few had exhibited estrus by 210 days of age (Table 1). Perhaps
elevated ambient temperature during the summer months delayed the attainment of
puberty of the spring born gilts maintained outside.

Anestrous confinement gilts averaged 236.1 ± 4.4 lb and 212.0 ± 1 days of age at
treatment. More gilts treated with PMSG and PMSG plus GnRH exhibited estrus
within six days after treatment than the controls or estradiol treated gilts (Table 2).
Conception rates were similar for the gilts on the three treatments that exhibited estrus,
and the numbers of embryos and corpora lutea at day 30 of pregnancy were not
influenced by treatment.

Ovarian follicular growth and maturation were stimulated by PMSG treatment.
The matured follicles secreted estrogen and caused the onset of standing heat. Ovu-
lation occurred either with or without GnRH treatment after PMSG. Since most anestr-
ous gilts responded to PMSG treatment, it appears that the ovaries were capable of
normal function.

These data suggest that confinement gilts not exhibiting estrus by 210 days of age
can respond to injections of PMSG and a fertile estrus will be induced. Season of the
year when a gilt is born and/or reaches puberty may have an effect on the response to
PMSG. Future studies at this station will investigate seasonal effects on puberty in
gilts.

**Table 1. Influence of confinement on body weight and estrous activity of
Yorkshire gilts.**

<table>
<thead>
<tr>
<th>Birth month</th>
<th>Treatment</th>
<th>Number of gilts</th>
<th>Estrus before 210 days</th>
<th>Weight at 210 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>November and</td>
<td>Confinement</td>
<td>15</td>
<td>3</td>
<td>242</td>
</tr>
<tr>
<td>December</td>
<td>Outside</td>
<td>8</td>
<td>5</td>
<td>213</td>
</tr>
<tr>
<td>February and</td>
<td>Confinement</td>
<td>25</td>
<td>4</td>
<td>230</td>
</tr>
<tr>
<td>March</td>
<td>Outside</td>
<td>13</td>
<td>0</td>
<td>240</td>
</tr>
</tbody>
</table>

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Table 2. Reproductive characteristics of anestrous gilts after hormone treatments.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Control</th>
<th>PMSG</th>
<th>PMSG &amp; GnRH</th>
<th>Estradiol</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of gilts</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>No. of gilts in estrus after treatment</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>No. of gilts pregnant to first estrus</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>No. of embryos</td>
<td>14.0</td>
<td>10.8</td>
<td>9.8</td>
<td>- - -</td>
</tr>
<tr>
<td>No. of corpora lutea</td>
<td>17.5</td>
<td>15.6</td>
<td>16.4</td>
<td>- - -</td>
</tr>
</tbody>
</table>