Treatment of pregnant gilts with a prostaglandin analogue, Cloprostenol, to control oestrus and fertility*

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Summary. Oestrus was induced 4–7 days after treatment with Cloprostenol (ICI 80,996) in gilts between 12 and 40 days pregnant. Fertility at this synchronized oestrus was good (85%).

Introduction

The corpora lutea (CL) of the pig do not regress in response to prostaglandin (PG) F-2α until treatment on Days 11–12 of the oestrous cycle (Gleeson, 1974; Halford, Wettemann, Turman & Omvedt, 1975; Guthrie & Polge, 1976a), but regress rapidly after Days 14–15 without PGF-2α treatment. The effective period for PGF-2α-induced luteolysis is therefore too short to be of practical use for synchronization of oestrus. Two techniques have been developed to establish populations of gilts with prolonged luteal sensitivity to PGF-2α, i.e. treatment with oestrogen (Guthrie, 1975; Kraeling, Barb & Davis, 1975) or with gonadotrophin to induce accessory CL (Guthrie & Polge, 1976b). Approximately 80% of the gilts inseminated at a PGF-2α-synchronized oestrus had embryos 4–7 days or 24–30 days later (Guthrie, 1975; Guthrie & Polge, 1976b).

The luteal phase of the oestrous cycle is also extended by pregnancy, and the purpose of the present experiment was to evaluate oestrus and fertility after PGF-2α treatment of gilts at various stages of gestation.

Materials and Methods

Mature, crossbred Large White gilts were checked once daily for oestrus with a vasectomized boar. The gilts were artificially inseminated on the 2nd day of oestrus with 100 ml fresh, undiluted semen from fertile boars. Sixty gilts were given two i.m. injections, 24 h apart, of 1·0 mg and 0·5 mg Cloprostenol (ICI 80,966: Imperial Chemical Industries Ltd), a structurally related PGF-2α analogue, in 2 ml 0·9% (w/v) NaCl solution starting 8 (N = 6 gilts), 12, 20, 26, 32 or 40 days (12 gilts/group) after the first day of oestrus. The treatment groups were designated D8, D12, D20, D26, D32 and D40, respectively.

Gilts that exhibited oestrus 4–7 days after the first Cloprostenol injection were artificially inseminated again. For counting of CL and recovery of embryos the gilts in Groups D12, D20, D26, D32 and D40 were laparotomized on Days 4–7 (Day 0 = first day of synchronized oestrus) or killed between Days 25 and 32. The embryos recovered on Days 4–7 were prepared as whole mounts, fixed in 25% acetic alcohol and stained with 1% lacmoid in 45% glacial acetic acid for cytological examination by phase-contrast microscopy. The 6 gilts in Group D8 were slaughtered 17–20 days after the first Cloprostenol injection (24–27 days after insemination).

The proportions of gilts exhibiting a synchronized oestrus after Cloprostenol treatment and maintaining pregnancy after insemination at the synchronized oestrus were evaluated statistically by χ² tests and the number of CL and embryos was evaluated by analysis of variance (Steel & Torrie, 1960). The level of statistical significance was 5%.

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Results

Treatment with Cloprostenol on the 8th and 9th days of gestation did not cause luteal regression. Five of the 6 gilts in Group D8 were pregnant at slaughter with a mean (±s.e.m.) of 13·0 ± 0·9 CL and 11·2 ± 2·6 embryos per gilt. The other gilt had a 21-day cycle.

Most of the gilts (87%) in the other groups exhibited a synchronized oestrus 4–7 days after the first injection (Table 1), but the day on which the injections were started had no significant effect. Gilts in Group D12 had fewer CL/animal than did those in Groups D20, D32 or D40 (Table 1).

Table 1. Oestrus and ovulation after treatment of pregnant gilts with Cloprostenol (1·0 mg followed by 0·5 mg 24 h later)

<table>
<thead>
<tr>
<th>Group</th>
<th>Days of treatment</th>
<th>In oestrus 4–7 days after treatment</th>
<th>With CL at slaughter</th>
<th>Mean (±s.e.m.) no. of CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>D12</td>
<td>12, 13</td>
<td>12</td>
<td>8</td>
<td>12·0 ± 0·8*</td>
</tr>
<tr>
<td>D20</td>
<td>20, 21</td>
<td>12</td>
<td>11</td>
<td>15·0 ± 1·0b</td>
</tr>
<tr>
<td>D26</td>
<td>26, 27</td>
<td>12</td>
<td>11</td>
<td>14·0 ± 0·5ab</td>
</tr>
<tr>
<td>D32</td>
<td>32, 33</td>
<td>12</td>
<td>10</td>
<td>15·7 ± 0·8b</td>
</tr>
<tr>
<td>D40</td>
<td>40, 41</td>
<td>12</td>
<td>11</td>
<td>15·6 ± 0·6b</td>
</tr>
<tr>
<td>Totals</td>
<td>60</td>
<td>52</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

Means with different superscripts differ significantly (P < 0·05, Duncan's Multiple Range Test).

Table 2. Fertility in gilts inseminated after induction of luteolysis with Cloprostenol and termination of pregnancy

<table>
<thead>
<tr>
<th>Time of embryo recovery (days)</th>
<th>Number of gilts</th>
<th>Mean (±s.e.m.) no. of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Treated</td>
<td>Inseminated</td>
</tr>
<tr>
<td>4–7</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>25–32</td>
<td>30</td>
<td>24</td>
</tr>
<tr>
<td>Totals</td>
<td>60</td>
<td>52</td>
</tr>
</tbody>
</table>

The pregnancy rate for the 52 gilts that were inseminated was 84·6%. There was no difference among groups (D12–D40) with respect to proportion of gilts with embryos or the number of embryos per gilt. Of the gilts that were inseminated, more were pregnant on Days 4–7 than on Days 25–32, but this difference was not statistically significant (Table 2). When laparotomized on Day 6, one gilt each in Groups D26 and D40 had 13 and 18 unfertilized ova, respectively. In the slaughtered gilts there were no embryos in 3 gilts in Group D20 and 1 gilt in Group D32 which returned to oestrus 20–24 days after the onset of the synchronized oestrus and in 1 gilt in each of Groups D20 and D40 which had pyometra.

Discussion

The proportion of gilts exhibiting oestrus and fertility after treatment with the PGF-2α analogue between 12 and 40 days of gestation was similar to that of PGF-2α-treated gilts with CL maintained by oestrogen treatment (Guthrie, 1975) or gonadotrophin-induced accessory CL (Guthrie & Polge, 1976b). Plasma progesterone concentrations were not measured, but the abortions were presumably due to the sharp decline in plasma progesterone concentrations characteristic of PGF-2α treatment started on Day 12 of the cycle (Guthrie & Polge, 1976a). Some embryonic tissues or fetuses were seen
during or after expulsion on the 2nd or 3rd days after the first Cloprostenol injection, but no attempt was made to record the start or duration of abortion. Treatment with Cloprostenol before Day 12 of pregnancy did not appear to affect embryonic survival up to 27 days of gestation.

PGF-2α treatment of inseminated gilts can be included with oestrogen or gonadotrophin treatment as a method of controlling oestrus in the pig. Gilts could be artificially or naturally inseminated during a 28-day period and then, following an interval of 12 days after the last insemination, oestrus could be induced by PGF-2α treatment.

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References


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