Farrowing response and piglet viability following Cloprostenol-induced farrowing in Duroc sows with prolonged gestation

National Research Centre on Pig, Indian Council of Agricultural Research, Guwahati, India

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A trial was carried out to assess the effect of controlled induction of farrowing on sow performance and piglet viability in sows with prolonged gestation. Thirty healthy pregnant Duroc sows were randomly assigned into two groups balanced across the treatment for parity and day of gestation. Group I (n = 13) received a single intramuscular dose of prostaglandin analogue (2 ml Cyclix® containing 263 µg/ml Cloprostenol) on day 114 of gestation. Group II (n = 17) was allowed to farrow naturally and kept as control group. Treatment effects were significant (P < 0.01) on litter size and weight at weaning. Significantly higher litter weight at birth was also observed in Group I (9.8 vs 5.04 kg; P < 0.01). Parturition loss was comparatively lesser in induced farrowing and a relatively higher percentage of piglet survivability was observed in Group I (90.2% vs 80.0%). Treatment effects were significant (P < 0.05) on incidence of stillbirth (8.0% vs 24.4% in Group I and II, respectively). Relatively higher number of animals farrowed during daytime (53.85%) in Group I as compared to Group II (29.41%). In prolonged gestational cases, induction of farrowing can be a useful managerial tool for improving the piglet survival and facilitating greater supervision of farrowing.

Keywords: farrowing induction; Cloprostenol; prolonged gestation; piglet viability; sow

1. Introduction

Farrowing performance and piglet survivability are important factors influencing the efficiency of swine production systems. Litter size and litter weight at weaning, being the most important criteria for profitability, are adversely affected due to perinatal mortality and reduced piglet viability (Rydhmer 2000; Quinton et al. 2006). Stillbirths remain a major problem in intensive pig farming and may account for 5–10% (Kaeoket 2006). Moreover, cases of prolonged gestation are commonly observed in exotic breeds especially in Duroc sows (116.5 ± 0.28 days) leading to higher incidences of stillbirths and perinatal mortality (Tamuli et al. 2011). Prolonged duration of farrowing is the most common cause of intra-partum stillbirths (Sprecher et al. 1974). With abortion near farrowing time, due to stillbirth and poorer maternal characteristics, sows with prolonged gestation period produce smaller litters with reduced piglet viability. Smith et al. (2013) opined that farrowing induction is a valuable tool when properly applied and that parity-specific farrowing induction protocols merit consideration. The administration of prostaglandin F2 alpha (PGF2α) or its analogues has been known to be effective for the induction of parturition in sows (Knox 2003). In swine, farrowing induction using PGF2α and its analogues is accomplished through luteolysis, stimulation of smooth muscle contraction and hormonal release from endocrine tissues (Smith et al. 2013). Natural analogues of prostaglandins are rapidly metabolized during endogenous release or exogenous administration. Potent synthetic analogues like Cloprostenol are more preferred because of their longer half-life and stronger binding affinity to specific PGF2 alpha receptors (Kimball et al. 1976) which serve to extend their activity and increase their safety. The present study, therefore, attempted to examine the influence of Cloprostenol-based farrowing induction on farrowing performance and litter traits in sows with prolonged gestation.

2. Material and methods

The experiment was performed at the Institute Farm Complex, National Research Centre on pig, Rani (Guwahati, Assam, India, 26.01° Lat. N., 91.34° Long. E., 56 m above MSL). All procedures involving the use of animals were conducted in accordance with the national guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals and were approved by the Institute Animal Ethics Committee. The animals represented in this study were apparently healthy purebred Duroc sows in their first and second parity.

*Corresponding author. Email: dasgokul@ymail.com

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2.1. Experimental design and animals

Thirty pregnant sows (Duroc breed, 143.45 ± 12.46 kg) with a history of prolonged gestation were randomly assigned into two groups balanced across the treatment for parity and day of gestation. Sows with history of more than 115 days gestation in the previous farrowing were included in the present study. Selected sows were maintained under total confinement system with identical ration schedule and management conditions. Each sow in Group I (n = 13) received a single intramuscular dose of prostaglandin (2 ml Cyclix®, containing 263 µg/ml Cloprostenol sodium, a potent synthetic analogue of PGF₂α). Selected sows were administered with Cloprostenol on day 114 of gestation at 10:30 hours. No apparent side effects could be observed after Cloprostenol injection except for transitory reduction in mothering ability with mild ferocious behaviour in few sows. After the treatment, sows were followed-up for the farrowing onset and duration, interval between the injections and beginning of farrowing, litter size, total live born and the percentage of daytime and night-time farrowing. Sows in Group II (n = 17) were allowed to farrow naturally and considered as the control group.

2.2. Statistical analyses

Variability in the data was expressed as the standard error of the mean (SEM) and P < 0.05 was considered to be statistically significant unless otherwise stated. Mean values with SEM were obtained for different variables at the breed level. All data gathered were entered in Excel spreadsheets and were analysed using GraphPad Prism® version 5.00 for Windows (GraphPad Software, San Diego, CA, USA). Piglet survivability and stillbirth incidence were expressed as percentages. Unpaired t-test was used to compare the means and proportional data were compared by Fisher’s exact test.

3. Results and discussion

Descriptive statistics for different farrowing variables are presented in Table 1. In the present study, sows in the farrowing-induced group (Group I) had a significantly shorter (P < 0.1) length of gestation period as compared to control group (Group II). Further, sows in Group I had a significantly shorter (P < 0.1) farrowing duration in comparison with spontaneously farrowed sows (3.16 ± 0.34 vs 4.38 ± 0.25 hours, respectively). This might be attributable to prostaglandin-induced uterine contraction and stimulation of relaxin production resulting in complete cervical softening and dilation. Coggins et al. (1977) observed that prolonged gestation was associated with longer farrowing duration (6–15 hours). In contrast to shorter duration of farrowing in induced animals in the current study, Kaeoket (2006) reported relatively longer farrowing duration (6 hours 30 minutes) after induction of farrowing with 175 µg of R-Cloprostenol in cross-bred multiparous sows. Long piglet birth intervals may result anoxia and poorer viability that predisposes to piglet neonatal mortality. Vallet et al. (2010) observed a significant negative association (P < 0.01) between litter size and birth intervals and stillbirth rate was increased (P < 0.01) for birth intervals of more than one hour. Interestingly, Oliviero et al. (2013) established that sows with longer duration of farrowing have higher repeat breeding rate at first insemination after weaning.

In the present study, mean interval to farrowing after Cloprostenol injection was 21.88 ± 2.47 hours. Balogh and Bilkei (2003) observed that more than 80% of sows farrowed within 36 hours of intramuscular injection of PGF₂α or its analogues administered at 112–114 days of gestation. In cross-bred multiparous sows administered with intramuscular injection of 175 µg Cloprostenol, the mean interval from treatment to farrowing was 27 hours 7 minutes (Chanapiwat & Kaeoket 2008). Another noteworthy finding in the present study was that relatively greater number of animals farrowed during daytime (53.85%) in farrowing-induced group as compared to control group (29.41%). It is observed that higher frequency of daytime farrowings can facilitate greater supervision which in turn may improve piglet survivability. Further, Cozler et al. (2002) reported that the number of litters with stillborn piglets decreased as supervision of par-turition increased.

Effect of farrowing induction on various piglet traits in sows with prolonged gestation is presented in Table 2. There was no significant difference (P > 0.05) on litter

<table>
<thead>
<tr>
<th>Animal group</th>
<th>Gestation period (days)</th>
<th>Treatment to farrowing interval (h)</th>
<th>Farrowing duration in hours</th>
<th>Time of farrowing (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (n = 13)</td>
<td>115.7 ± 0.24&lt;sup&gt;a&lt;/sup&gt;</td>
<td>21.88 ± 2.47</td>
<td>3.16 ± 0.34&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Daytime: 53.85, Night-time: 46.15, Weaning-to-oestrus interval: 18.60 ± 3.36</td>
</tr>
<tr>
<td>Group II (n = 17)</td>
<td>117.4 ± 0.44&lt;sup&gt;b&lt;/sup&gt;</td>
<td>–</td>
<td>4.38 ± 0.25&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Daytime: 29.41, Night-time: 70.59, Weaning-to-oestrus interval: 22.50 ± 7.37</td>
</tr>
</tbody>
</table>

<sup>a,b</sup>Values with different superscripts within the same column are significantly different (P < 0.1).
Table 2. Effect of farrowing induction with Cloprostenol on piglet traits in Duroc sows with prolonged gestation (mean ± SEM).

<table>
<thead>
<tr>
<th>Animal group</th>
<th>At birth (kg)</th>
<th>At weaning (kg)</th>
<th>Incidence of stillbirth (%)</th>
<th>Litter weight at birth (kg)</th>
<th>Litter weight at weaning (kg)</th>
<th>Piglet survivability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (n = 13)</td>
<td>6.13 ± 0.57</td>
<td>5.53 ± 0.66</td>
<td>8.0a</td>
<td>9.8 ± 1.13</td>
<td>46.5 ± 5.64</td>
<td>90.2</td>
</tr>
<tr>
<td>Group II (n = 17)</td>
<td>4.82 ± 0.65</td>
<td>3.06 ± 0.54</td>
<td>24.4b</td>
<td>5.04 ± 0.86</td>
<td>26.2 ± 4.55</td>
<td>80.0</td>
</tr>
</tbody>
</table>

*a,bValues with different superscripts within the same column are significantly different (P < 0.05).

size at birth between the groups. Litter size at birth was 6.13 ± 0.57 in Group I as compared to 4.82 ± 0.65 in sows of spontaneously farrowed group. Correspondingly, Smith et al. (2013) reported a similar effect on litter size at birth in sows with farrowing induction on days 114 and 116 under commercial conditions. Holyoake et al. (1995) also found no significant difference (P > 0.05) in litter size between sows induced on day 112 and non-induced sows. Nevertheless, treatment effect was significant (P < 0.05) on litter size at weaning possibly due to high piglet survivability rate and better supervision in the induced group. Further, significantly higher (P < 0.05) litter weight at birth was also observed in Group I as compared to Group II (9.8 vs 5.04 kg, respectively). Mean litter weight at weaning was also significantly higher (P < 0.05) in sows of the induced group than in spontaneously farrowed sows. The parturition loss was comparatively lesser in induced farrowing and relatively higher percentage of piglet survivability was observed in Group I (90.2% vs 80.0%) in comparison with Group II. Treatment effect was significant (P < 0.05) on the incidence of stillbirth with lower stillbirth proportion of 62% in spontaneously farrowed sows.

4. Conclusion

In conclusion, controlled farrowing induction using synthetic analogue of PGF$_2$α (Cloprostenol) after 114 days of gestation in conjunction with skilled supervision can serve as a useful managerial tool for improving piglet survival and allowing batch management especially in sows with prolonged gestation. It can be effectively incorporated as a part of sow management programmes with better supervision enabling more timely farrowings and production of more number viable piglets with heavier weaning weights.

References


