Effect of oFSH dosages in superovulation protocol on ovarian responses in goat

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Abstract

A total of 35 crossbred goats were used to evaluate the effect of oFSH dosages on ovarian responses during superovulation. CIDR was inserted for 10-15 days and were divided into 3 groups, namely Groups M₁, M₂ and S receiving 8.8 mg and 14.08 mg of oFSH through multiple intramuscular (i.m.) injection starting from 2 days before the CIDR removal and 8.8 mg of oFSH through single i.m. injection upon CIDR removal, respectively. Ovarian responses of all treatments were evaluated during laparotomy session on days 3 or 7 after CIDR removal. All the does (100%, 22/22) of Group M₁ and M₂ responded to the treatments by ovulating at least 1 corpus luteum (CL). On the other hand, only 69% (9/13) of the does of Group S was responded correspondingly to the treatment. The total ovarian responses (CL plus anovulatory follicles) among the treatments were significantly (P<0.05) higher in multiple administration groups (Groups M₁ and M₂) than the single administration group (Group S). Although no significant (P>0.05) differences were found between multiple administration groups for ovarian responses, high dosage of oFSH gave higher percent ovulation and CL per doe (72.4% ± 7.6 vs. 58.8% ± 3.9 and 16.9 ± 3.9 vs. 11.6 ± 1.0, respectively) compared to low dosage. The anovulatory percentage of follicles was significantly (P<0.05) higher in Group S followed by Groups M₁ and M₂. The structure (embryo plus oocyte) recovery rate per doe was significantly (P<0.05) higher in Group M₂ followed by Group M₁ and lowest in Group S (5.4 ± 2.4, 3.2 ± 1.2 and 0.5 ± 0.5, respectively). It is concluded that multiple injection at high dosage of oFSH in goat superovulation protocol gives better ovarian responses than multiple injection at low dosage as well as single injection of oFSH. However, more detailed research is needed to optimise the amount of gonadotrophin for superovulation of Malaysian crossbred goats.

Keywords: superovulation, oFSH dosage, ovarian response, multiple-single injection, goat

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Introduction

Continuous supply of viable embryos is the key factor to ensure the success of any multiple ovulation and embryo transfer (MOET) in goat breeding programme. Specifically, superovulation is the most fundamental step in obtaining multiple embryos from a donor. In any superovulation protocol, the ovarian response is controlled by administration of different preparation of exogenous gonadotrophins, resulting in follicular recruitment, maturation and finally ovulation of a large number of responded follicles. Superovulation protocol consists of oestrus synchronisation by inserting 11-17 days of CIDR into the vagina and superovulation treatment by administration of gonadotrophins starting at 48-72 h before CIDR removal (McNatty et al., 1989; Selgrath et al., 1990; Gonzalez-Bulnes et al., 2003). Superovulation responses vary, depending on extrinsic (origin and purity of gonadotrophin and superovulation protocol for administration of gonadotrophin and nutrition) and intrinsic (breed, age and breeding stage ) factors (Baril et al., 1993). The objective of this study was to evaluate the effect of oFSH dosages on ovarian responses during superovulation in goat.

Materials and Methods

Animals and location of research

Thirty five mature mixed Malaysian crossbred does of 1 to 4 years old and 18 to 45 kg body weight were reared at the Institute of Biological Sciences Mini Farm, University of Malaya. Does were fed with pellet in the morning and Napier grass in the evening. Clean water and salt lick were supplied ad libitum. The study was conducted from December 2009 till July 2010.

Hormonal treatments

Oestrus was synchronised by using 10-15 days controlled internal drug release (CIDR) insertion. The superovulatory treatments was as follows: Groups M1, M2 and S received 8.8 mg and 14.08 mg of oFSH through multiple i.m. injection starting from 2 days before the CIDR removal and 8.8 mg of oFSH through single i.m. injection upon CIDR removal, respectively. During oestrus, all the does were naturally bred using buck with proven fertility.

Ovarian responses assessment

Ovarian responses for all the treatments were evaluated during laparotomy session on days 3 or 7 after CIDR removal. In other words, embryos from all groups were recovered on day 3 for oviduct flushing or day 7 for uterus flushing. The donor goats were off feed and water for 15 hr before surgery. After anaesthetised, The reproductive tract of goat was exteriorised through a mid-ventral incision and flushed by using a flushing medium. The recovered structures (embryos plus unfertilised ova) in flushing medium were evaluated and classified accordingly under a stereo-microscope. The total number of CL, anovulatory follicles, embryo plus ova recovered were calculated and comparisons between treatments on parameters measured were made using appropriate statistical methods.

Results and Discussion

Ovarian responses of three hormonal treatments groups are presented in Table 1. All the does (100%, 22/22) of Groups M1 and M2 responded to the treatments by ovulating
Table 1. Ovarian response (mean ±SEM) in superovulated donor goats treated with different dosages of oFSH

<table>
<thead>
<tr>
<th>Parameters</th>
<th>S (single administration of 8.8 mg oFSH)</th>
<th>M1 (multiple administration of 8.8 mg oFSH)</th>
<th>M2 (multiple administration of 14.08 mg oFSH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of animals (n)</td>
<td>13</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Percentage of responded does (n)</td>
<td>69 (9)</td>
<td>100 (13)</td>
<td>100 (9)</td>
</tr>
<tr>
<td>Ovarian response (CL plus AF/doe)</td>
<td>8.5±1.4a</td>
<td>20.0±1.5b</td>
<td>23.7±4.4b</td>
</tr>
<tr>
<td>Percent ovulation (%)</td>
<td>35.5±10.0a</td>
<td>58.8±3.9b</td>
<td>72.4±7.6b</td>
</tr>
<tr>
<td>CL/doe</td>
<td>2.7±0.7a</td>
<td>11.6±1.0b</td>
<td>16.9±3.9b</td>
</tr>
<tr>
<td>Anovulatory percentage (%)</td>
<td>60.7±11.1b</td>
<td>41.2±3.9b</td>
<td>28.2±7.8a</td>
</tr>
<tr>
<td>Anovulatory follicle (AF)/doe</td>
<td>6.2±1.5a</td>
<td>8.4±1.1a</td>
<td>7.0±1.7a</td>
</tr>
<tr>
<td>Structures recovered/doe (embryos plus ova/doe)</td>
<td>0.5±0.5a</td>
<td>3.2±1.2b</td>
<td>5.4±2.4b</td>
</tr>
<tr>
<td>Unfertilised plus degenerated ova/doe</td>
<td>0.5±0.5a</td>
<td>0.8±0.5a</td>
<td>3.4±2.0a</td>
</tr>
<tr>
<td>Viable embryos/doe</td>
<td>0.1±0.1a</td>
<td>2.4±1.0a</td>
<td>2.0±1.4a</td>
</tr>
</tbody>
</table>

abc mean values with different superscripts in a row differ significantly (P<0.05)

at least 1 corpus luteum (CL). On the other hand, only 69% (9/13) of the does of Group S was responded to the corresponding treatment. The total ovarian responses (CL plus anovulatory follicles) among the treatments were significantly (P<0.05) higher in multiple administration groups (Groups M1 and M2) than the single administration group (Group S). Although no significant (P>0.05) differences were found between multiple administration groups for percent ovulation and CL per doe, higher dosage of oFSH gave higher results (72.4% ± 7.6 vs. 58.8% ± 3.9 and 16.9 ± 3.9 vs. 11.6 ± 1.0, respectively). The anovulatory percentage of follicles was significantly (P<0.05) higher in Group S followed by Groups M1 and M2. The structures (embryo plus unfertilised oocyte) recovered per doe was significantly (P<0.05) higher in Group M2 followed by Group M1 and in Group S (5.4 ± 2.4, 3.2 ± 1.2 and 0.5 ± 0.5, respectively). Viable embryos obtained were 0.1±0.1, 2.4±1.0 and 2.0±1.4 per doe for Groups S, M1 and M2, respectively. Interestingly, even though there were no differences among the treatment groups for viable embryos, apparently, low dosage of multiple administration showed higher viable embryos per doe. The number of recovered viable embryo per doe by using FSH was reported to be 6.6 in Jakhrana (Goel and Agrawal, 2005), 2.07 in Jamunapari (Goel et al., 1993), 5.11 in Jamunapari (Goel and Agrawal, 1990), 4.72 in Pashmina (Mahmood et al., 1991), 8.70 in Alpine and Nubian (Nuti et al., 1987) and 6.0 in Korean Native goats (Lee et al., 2000).

Conclusions

Among three gonatrophin treatments designed for this study, ovarian responses, specifically in terms of percentage of responded does, percent ovulation, CL/doe, anovulatory percentages show better results in multiple oFSH administration groups compared to the oFSH single administration. It is concluded that multiple injection at high dosage of oFSH in goat superovulation protocol gives better ovarian responses than multiple injection at low dosage.
as well as single injection of oFSH. However, more detailed research is needed to optimise the amount of gonadotrophin for superovulation of Malaysian crossbred goats.

References


