Follicular and ovulatory responses of the right versus left ovaries to eCG treatment in Shall Iranian ewes

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The present study considers the right versus the left ovarian responses to the different doses of eCG treatment in ewe. The estrous cycles of 32 adult Shall Iranian ewes were synchronized by CIDR during breeding period. At the time of CIDR removal, 0 (n = 8), 450 (n = 8), 550 (n = 8) and 650 (n = 8) IU of eCG (Intervet, Booxmer, Netherlands) was administered to ewes. The number of large follicles (> 3 mm, LF) and CL in the right and left ovaries was monitored by transrectal ultrasonography on the day of estrus and 6 days later. In another analysing view, all ewes (n = 32) were set into 3 groups. Following superovulation, groups A and D ewes had at least one extra large follicle and CL, respectively, in their right ovary than that of the left one. Group B and E had the opposite position and group C and F had equal LF in their ovaries. The data were analysed by GLM procedure of SAS. The mean number of LF in the right (2.35 ± 0.14) was higher (P < 0.001) in comparison to the left (1.42 ± 0.14) ovaries in all treatment groups. Also, the mean number of LF in the right was higher (P < 0.05) than that in the left ovaries between every treatment group. In addition, the mean number of CL in the right (1.92 ± 0.47) was higher (P < 0.05) in comparison to the left (1.33 ± 0.25) ovaries in all treatment groups. Furthermore, in the other analysis, we observed 62.5% of the ewes were in group A (n = 20) which was a higher (P < 0.001) percentage compared to group B (n = 4, 12.5%) and group C (n = 8, 25%). Also, it is observed that 44% of the ewes were set into group D (n = 16) (the right ovary had at least one CL extra in comparison with the left ovary) which was a higher (P < 0.05) percentage compared to groups E and F; and that both groups had equal number of ewes. The results suggest that the greater responses of follicular development occur in the right ovaries after eCG treatment in Shall Iranian ewes.

Key words: Ewe, Shall, follicle, CIDR, eCG.

INTRODUCTION

Equine chorionic gonadotrophin (eCG) increases ovulation rate in the ewe by recruiting small ovarian follicles, increasing the growth rate of antral follicles and altering ratios of large follicle size-classes at estrus. However, eCG does not appear to rescue follicles from atresia in the ewe (Driancourt et al., 1992). eCG causes early oocyte activation (Moor et al., 1985) and follicles exposed to eCG synthesize larger amounts of progesterone (Driancourt et al., 1992)

There is evidence that showed that administration of eCG in the time of CIDR removal is the most common, in order to increase the superovulation responses in ewes (Boscos et al., 2002; Menegatos et al., 2003; Barrett et al., 2004). However, low doses of eCG (300 - 500 IU) has been combined with CIDR treatment which probably has little effect on ovulation rate but reduces the interval to the onset of estrus when compared with ewes fully administered with CIDR (Barrett et al., 2004; Botha et al., 1975; Gordon, 1971). In contrast, increasing doses of eCG can enhance the ovulation rate (Robinson, 1951).

In most ewe breeds, ovulation is performed in more than 2 or 3 of the ovulatory follicles during estrous cycle. Ovulation rate in ewes enhances with increasing age. It is showed that ovulation rate in right ovary (53.4%) was
significantly more than the left ovary (46.6%) (Scaramuzzi and Downing, 1997). Also, it was suggested that unequal functions occur between the right and left ovaries in various species including ewes (Casida et al., 1966). Casida et al. (1966) reported that the right ovary produces more corpus luteum (CL) comparing to the left ovary in ewes. Naqvi and Gullany (1998) showed that the right ovary has a greater number of CL and large follicles in response to eCG or Follicle Stimulating Hormone (FSH) treatment. However in heifers, it was reported that there is an effect of the day relative to initiation of FSH treatment on all follicular categories responding positively to superovulation and there is no effect of side (left or right ovary) or of CL diameter (ipsilateral or contralateral) (Purwantara et al., 1993).

The present study was conducted to consider the right versus the left ovarian responses (that is the mean number of follicles > 3 mm in diameter at estrus and the number of CL 6 days later) to the different doses of eCG treatment.

MATERIALS AND METHODS

Animals and management

The experiment was conducted in breeding seasons (September - November). The institute farm is located in Saveh city at 50.19 ± 21° E, latitude of 35.01 ± 13° N and at an altitude of 1250 m above mean sea level in semi-arid tract of the country. The annual rainfall ranges from 220 mm with an erratic distribution throughout the year. Thirty two adult Shall Iranian ewes, between 2 and 4 years of age and body weight 69 kg (range 60 - 80) were housed in conditions of natural daylight and temperature and were in good body condition throughout the observational period. The ewes were provided with water ad libitum and were fed a live weight maintenance ration during breeding period.

Estrous synchronization and superovulatory program

Estrous cycles of the animals were synchronized by CIDR (EAZI-BREED™ CIDR®; progesterone). The day of CIDR insertion was considered as the starting point of the experiment (day 0). At the time of CIDR removal (day 14), the ewes were randomly divided equally (n = 8) among four superovulation groups: 0 (control), 450 (G1), 550 (G2) and 650 (G3) IU of eCG (Intergonan ®, Intervet, Toenisvorst, Netherlands) was administered to ewes. The animals were observed for estrus behaviour using a vasectomised rams.

Ultrasound examination

The right and left ovaries were monitored by transrectal ultrasonography (Piemedical, Falco100; Holland, with an 8 MHz transducer) on days 16 (day of estrus) for observation of the large follicles (LF) and 22 for observation of the number of CL. During examination the animals were held in a standing position. Scanning of both ovaries was recorded using a MP4 player (Marshal X720, China). Follicles > 3 mm in diameter were identified, measured and mapped to their location using printed images of both ovaries.

In another analysing view, all ewes (n = 32) were set into 3 groups on day 16. Following superovulation, group A ewes had at least one extra large follicle in their right ovary in compare to their left ovary at estrus. Group B had the opposite position in their ovaries and group C had equal LF in both ovaries. Similarly all ewes were divided into 3 groups on day 22. Group D ewes had at least one extra CL in their right ovary in compare to their left ovary. Group E had the opposite position in their ovaries and group F had equal CL in both ovaries.

Statistical analysis

An analysis of variance was used for the comparison between treatment groups regarding the mean number of follicles and the mean number of CL. When a significant difference was recorded, the Duncan’s multiple range test was used to determine how the means differed. The SAS-program was used in the analyses.

RESULTS

All ewes showed estrus behaviour and ovulation until 48 and 82 h after the end of the synchronization treatment, respectively. The mean number of large follicles (> 3 mm in diameter) in the right (2.35 ± 0.14) was higher (P < 0.001) in comparison to the left (1.42 ± 0.14) ovaries in all treatment groups. Also, the mean number of LF in the right was higher (P < 0.05) than in the left ovaries within treatment groups (Figure 1). In addition, the mean number of CL in the right (1.92 ± 0.47) was higher (P < 0.05) in comparison to the left (1.33 ± 0.25) ovaries in all treatment groups. However, the mean number of CL in the right ovaries was not significantly different from the left ovaries within treatment groups (Figure 2).

The mean number of large follicles in the right ovaries of groups that was administrated eCG was higher (P < 0.05) in comparison to the right ovaries in control group (Table 1). In addition, the mean number of CL in the right ovaries of only group G3 was higher (P < 0.05) in comparison to the left ovaries in control group (Table 1). On the other hand, the mean number of large follicles and CL in the left ovaries of groups G1, G2 and G3 was not significantly different from the left ovaries of control group.

Furthermore, in the other analysis, we observed 62.5% of the ewes were in group A (n = 20) which was a higher (P < 0.001) percentage compared to group B (n = 4, 12.5%) and group C (n = 8, 25%). Also, 44% of the ewes were set into group D (n = 16) (the right ovary had at least one CL extra in comparison the left ovary) which was a higher (P < 0.05) percentage compared to group E and group F that both groups had the number of equal ewes (Figure 3).

DISCUSSION

All ewes treated with eCG showed estrus behaviour (acceptance of the male and mucus discharge) and ovulation (disappearance of large follicles and observation of CL) after the end of the synchronization treatment. The addition of low-dose eCG (300 - 500 IU) to progestogen
CIDR treatment can cause advancement of estrus and ovulation and a small increase in ovulation rate in ewes (Ainsworth et al., 1977). The timing of estrus and ovulation in eCG-treated ewes in our study was similar to that in other studies (Boland et al., 1978; Gordon, 1997). The preovulatory follicles (> 3 mm in diameter) are the source of estradiol hormone (Barrett et al., 2004), which probably resulted in appearance of estrus and ovulation in all of experimental groups.

We were able to detect ovaries with reasonable frequency by rectal ultrasonography in Iranian Shall ewes during standing position that is more comfortable for the ewes than dorsal recumbency (Riesenber et al., 2001). Overall, significantly more ovaries were observed after superovulation with low doses of eCG than control group (P < 0.05). This finding could not be explained either by a higher number or by a smaller diameter of follicles, suggesting (Riesenber et al., 2001) that the ovaries themselves were enlarged after eCG stimulation. Moreover, using of MP4 for recording, reviewing and drawing each ultrasonography in this experiment was much easier and faster in comparison to other experiment that was usually performed by a set of video.

In the present study, the administration of different doses of eCG at CIDR withdrawal increased the mean number of large follicles and the ovulation rate. This is in accordance with results of other authors, although the mechanism by which eCG increased the mean number of large follicles and ovulation rate is not yet clear (Driancourt et al., 1991). There are several possibilities, namely an increased rate of entry of follicles into the > 2 mm size category, the prevention of the occurrence of natural atresia or the reversal of the atretic process (Bister et al., 1999; Mandiki et al., 2000).

The mean number of LF (> 3 mm follicles) and CL in the right ovaries was higher (P < 0.05) in comparison to
Table 1. Effect of different doses of eCG on the mean (±S.E.M.) number of large follicles and CL on the right versus left ovaries following synchronization of estrus in ewe.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of LF on the right ovaries</td>
<td>1.5 ± 0.25¹</td>
<td>2.5 ± 0.25²</td>
<td>2.6 ± 0.25²</td>
<td>2.8 ± 0.25²</td>
</tr>
<tr>
<td>Number of CL on the right ovaries</td>
<td>1.4 ± 0.18¹</td>
<td>2.0 ± 0.18¹</td>
<td>1.9 ± 0.18¹</td>
<td>2.4 ± 0.18²</td>
</tr>
<tr>
<td>Number of LF on the left ovaries</td>
<td>1.0 ± 0.12¹</td>
<td>1.6 ± 0.12¹</td>
<td>1.4 ± 0.12¹</td>
<td>1.7 ± 0.12¹</td>
</tr>
<tr>
<td>Number of CL on the left ovaries</td>
<td>0.8 ± 0.11¹</td>
<td>1.4 ± 0.11¹</td>
<td>1.6 ± 0.11¹</td>
<td>1.5 ± 0.11¹</td>
</tr>
</tbody>
</table>

Values with different superscripts (1 and 2) in the same row differ significantly (P < 0.05).

In conclusion, the superovulatory responses examined in terms of the mean numbers of large follicles at estrus and ovulations 6 days later in the right versus the left ovaries in this experiment were similar to those previously reported. The tendency for ovulation to take place more often in the right or left ovary is not previously proven. However, in this experiment and several previous studies it has been shown that activity of the right ovary is more than the left one. In consequence, in several investigations it was observed that the number of large follicle and the number of CL in response to super-ovulation especially, after injection of eCG in the right ovary is higher than the left ovary.

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REFERENCES


