Serum calcium concentration of silent estrous, treated silent estrous and normal estrous crossbred cows on different days of estrous cycle

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Abstract

The present study was conducted to find out the concentration of calcium in treated and non-treated silent estrous and normal estrous crossbred cows. The mean concentration of calcium in serum was ranged from 9.10 to 11.44 mg / dl in treated silent estrous cows, while the values ranged from 8.67 to 9.69 mg / dl in non-treated silent estrous cows and in normal estrous cows the values ranged from 8.95 to 10.46 mg / dl. Significantly higher (P<0.01) level of serum calcium was recorded on the day of oestrus in both silent and normal estrous cows than on day 10 and 17 of the estrous cycle.

Keywords: Serum calcium, crossbred cows, silent estrous, estrous cycle

Introduction

Calcium is the major structural elements of skeletal tissue and more than 99 per cent calcium being found in the bone and teeth but small amount circulating in the blood stream and body fluids. It is an essential mineral needed in every day bodily functions which helps to perform several important functions such as muscle contraction and relaxation, heart contraction, clotting of blood, nerve impulse conduction, milk production, keeping of intact cell membranes, intestinal movement, Transformation of light to electrical impulses in retina, and metabolism of enzymes and hormones. It allows important nutrients to be able to move in and out of the cells in the body. The normal level of blood calcium in animals ranges from 9 to 11 mg per 100 ml of serum (Verma, 1995) [1].

During oestrus more serum calcium level is necessary to support the increased neuromuscular activity and ovarian hormone synthesis. During dioestrus phase of the estrous cycle less concentration of serum calcium is needed (Yaqub et al., 2013) [10].

Materials and Methods

Ethical approval

All applicable institutional ethical guidelines for care and use of animals were followed.

For the present study a total of fifty (50) crossbred cows with silent oestrus on the basis of criteria that the postpartum crossbred cows which failed to exhibit oestrus symptoms till 90 days after parturition were investigated and the cows which had palpable structures on either ovary or had genital changes like that of an oestrus cow were categorized as silent estrous cows and were selected for different treatment regimens. They were divided into five groups viz. Group A, B, C, D and E comprising 10 animals in each group and treatment was initiated from the day of detection of oestrus.

Group A: The cows in this group were supplemented with Mineral mixture (Ca, P, Mg, Zn, Cu) @ 50 g / cow / day orally for 20 days.

Group B: The cows in this group were supplemented with Mineral mixture@ 50 g / cow / day orally for 20 days + Vitamins (vitamins A, D3, C, E, B12) 10 ml / cow / day orally for 20 days.
Group C: This group of silent estrous cows was supplemented with Mineral mixture @ 50 g / cow / day orally for 20 days + Vitamins 10 ml / cow / day orally for 20 days + Enzymes 10 g / cow / day orally for 20 days.

Group D: This group of cows was supplemented with Mineral mixture @ 50 g / cow / day orally for 20 days + Vitamins 10 ml / cow daily orally for 20 days + Enzymes 10 g / cow / day orally for 20 days + Protein 25 g / cow / day orally for 8 days.

Group E: This group consisted of 10 silent estrous cows and were not provided any treatment and served as control.

Group F: This group consisted of 10 normal oestrous cows and was not provided any treatment.

Blood samples were collected on day 0 (1st day of detection of oestrus), day 10, day 17 of the cycle and on day 20 (day of next oestrus). The serum of collected samples were preserved at – 20° C for analysis of calcium. The serum calcium was estimated by using calcium kit manufactured by Greiner, Germany, as per Colorimetric, Arsenazo III method described by Bauer (1981).

Table 1: Serum calcium level (mg/dl) on different days of cycle treated with different treatment regimens and in normal cyclic cows

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Day 0 Mean ± S.E.</th>
<th>Day 10 Mean ± S.E.</th>
<th>Day 17 Mean ± S.E.</th>
<th>Day 20 Mean ± S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>9.38, AB ± 0.21</td>
<td>9.10, a ± 0.14</td>
<td>9.54, ab, AB ± 0.39</td>
<td>10.25, a ± 0.34</td>
</tr>
<tr>
<td>Group B</td>
<td>10.42 ± 0.49</td>
<td>10.20 ± 0.23</td>
<td>10.18 ± 0.44</td>
<td>10.41 ± 0.42</td>
</tr>
<tr>
<td>Group C</td>
<td>9.54, AB ± 0.40</td>
<td>9.31, a ± 0.49</td>
<td>10.32, AB ± 0.39</td>
<td>10.78, AB ± 0.38</td>
</tr>
<tr>
<td>Group D</td>
<td>10.67, AC ± 0.42</td>
<td>9.87, AB ± 0.39</td>
<td>9.62, b, AB ± 0.36</td>
<td>11.44, AB ± 0.45</td>
</tr>
<tr>
<td>Group E</td>
<td>9.69, AB ± 0.25</td>
<td>8.87, AB ± 0.26</td>
<td>8.67, b ± 0.24</td>
<td>9.62, AB ± 0.17</td>
</tr>
<tr>
<td>Group F</td>
<td>9.46, AB ± 0.31</td>
<td>9.02, b ± 0.11</td>
<td>8.95, b ± 0.05</td>
<td>9.86, AB ± 0.32</td>
</tr>
</tbody>
</table>

Means with different subscripts (a,b,c) within a column and superscripts (A,B,C) within a row differ significantly (P<0.01).

The mean concentration of calcium in serum was ranged from 9.10 to 11.44 mg / dl in treated silent estrous cows and in normal estrous cows. In the present study, while the values ranged from 8.67 to 9.69 in non-treated silent estrous cows and in normal estrous cows the values ranged from 8.95 to 10.46 mg / dl. Significantly higher (P<0.01) level of calcium was recorded on the day of oestrus in both silent and normal estrous cows than on day 10 and 17 of the estrous cycle. This finding was found to be similar with the findings of Jindal et al. (1990) [6], Dutta (1999) [8], Dutta et al. (2001) [4], Bonia and Baishya (2011) [2] and Khan et al. (2015) [7]. While Sahukar et al. (1984) [8] and Verma et al. (1984) [9] reported lower values of calcium during oestrus.

Peak serum calcium concentration observed at day 20 (day of oestrus) might be due in part to high serum concentration of estradiol during this phase. This finding agrees with the observations of Yaqub et al. (2013) [10], who reported high blood calcium concentration in ewes during the oestral phase of the oestrous cycle. High estradiol levels during oestral phase causes increased intestinal absorption of calcium (Brommage et al., 1993) [3]. In addition, the ability of estradiol to retain salt and to alter ion transport in various other epithelial cells could be partly responsible for high serum calcium observed during the oestrus phase. Furthermore, increased muscular activities during the oestrous phase as a result of psychic manifestation of oestrus may also be responsible for the increase in serum calcium level in extracellular fluid during the follicular phase of the estrous cycle. This increase in serum calcium level in oestrous may be necessary to support the increased neuromuscular activity, and ovarian hormone synthesis and release associated with this phase of the estrous cycle. The decline in serum calcium recorded on day 10 of the cycle may be due to decline in peripheral estradiol concentration and, thus, decreased intestinal calcium absorption during this period. Also, the decline in serum calcium may be due to a decrease in neuromuscular excitability during the dioestrus phase of the estrous cycle (Yaqub et al., 2013) [10].

Conclusion

It can be concluded from the present study that there was slight variation in the mean concentration of serum calcium of normal silent estrous cows, treated silent estrous and normal estrous cows and also significantly higher (P<0.01) level of calcium was observed on the day of oestrus in both silent and normal estrous cows than on day 10 and 17 of the estrous cycle.

References


