BLOOD MINERAL PROFILE IN FERTILE AND INFERTILE CATTLE AND BUFFALO BULLS

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ABSTRACT

Serum calcium and phosphorus were estimated in fertile and infertile cattle and buffalo bulls. The fertile bulls had higher calcium (cattle: 10.27±2.53 mg %; buffalo: 6.30±0.87 mg %) than the infertile ones (cattle: 5.92±1.07 mg %; buffalo: 5.60±0.40 mg %). Similarly serum inorganic phosphorus was higher in fertile cattle (3.96±0.32 mg %) and buffalo bulls (3.99±0.45 mg %) than the infertile ones (cattle: 2.40±0.12 mg %; buffalo: 2.86±0.38 mg %). The differences in serum phosphorus between fertile and infertile cattle bulls were significant (P< 0.01). Calcium/phosphorus ratio did not show any variation in both the species. Species differences in serum mineral values were observed. Cattle had higher serum calcium (8.09±1.80 mg %) than buffalo bulls (5.95±0.63 mg %), while phosphorus was lower in cattle (3.18±0.22 mg %) than buffalo (3.42±0.41 mg %). Calcium/phosphorus ratio was higher in cattle (2.54) than buffalo (1.74). It can be concluded that lower levels of serum calcium and phosphorus may be one of the several causes of infertility in cattle and buffalo bulls.

Minerals are involved in numerous body functions as structural elements and biochemical reactions (Hays and Swenson, 1996). The role of calcium and phosphorus in male reproduction has been reported (Moen et al., 1998; Attai et al., 1999; Nasir et al., 1999) but their levels in fertile and infertile bulls are rarely investigated. The present study was undertaken keeping this problem in view.

Nine bulls and eight buffalo bulls were divided into two groups i.e. fertile and infertile depending upon their seminal picture (Table 1). The bulls with less than 40 per cent initial motility were taken as infertile and more than 40 per cent as fertile. Standard managerial practices at the farm were practiced. Each bull was fed ad lib on seasonal green forages and chopped wheat straw in addition to 5.0 kg concentrate mixture having 16 per cent digestible crude protein and 70 per cent total digestible nutrients.

Semen was collected 2 times a week using artificial vagina. It was evaluated for volume, colour, density, mass activity and initial motility using standard procedures. About 10 ml blood was collected from each bull by jugular vena puncture in chilled glass vials. The blood was allowed to clot for four hours at 4°C and centrifuged at 1700g for 15 minutes to separate the sera. The sera was frozen at -20°C till analysis. Serum calcium and phosphorus were estimated as per Gietelman (1967) and Daly (1972), respectively. The data were analyzed for analysis of variance as per Snedecor and Cochran (1967).

Lower value of calcium and phosphorus was obtained in infertile bulls in cattle and buffalo (5.92±1.07 mg % and 5.60±0.40 mg %) compared to fertile ones (10.27±2.53 mg % and 6.30±0.87 mg %). The per cent decrease in calcium value in infertile bulls was 42.36 in cattle and 11.11 in buffalo. The value of phosphorus was significantly (P< 0.01) lower in infertile bulls in cattle (2.40±0.12 mg %) and buffalo (2.86±0.38 mg %) compared to fertile cattle (3.96±0.32 mg %) and buffalo (3.99±0.45 mg %). The per cent decrease in phosphorus value in infertile cattle and buffalo was 39.39 and 28.32, respectively. Calcium/phosphorus ratio did not show any specific trend in both the species.

The species differences in cattle and buffalo regarding mineral values were observed.
Table 1. Average values +SE of seminal characteristics in fertile and infertile bulls in different species

<table>
<thead>
<tr>
<th>Seminal characteristics</th>
<th>Species</th>
<th>Cattle</th>
<th>Buffalo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fertile (4)*</td>
<td>Infertile (5)*</td>
<td>Fertile (4)*</td>
</tr>
<tr>
<td>Volume (ml)</td>
<td>6.46±0.15</td>
<td>5.52±0.49</td>
<td>3.47±0.37</td>
</tr>
<tr>
<td>Consistency (0-3 scale)</td>
<td>2.47±0.08</td>
<td>1.91±0.16</td>
<td>2.26±0.06</td>
</tr>
<tr>
<td>Mass activity (0-3 scale)</td>
<td>2.36±0.19</td>
<td>0.50±0.20</td>
<td>1.19±0.26</td>
</tr>
<tr>
<td>Initial mortality</td>
<td>59.82±1.35</td>
<td>20.72±4.79</td>
<td>49.66±6.66</td>
</tr>
</tbody>
</table>

* No. of animals

Calcium was lower in buffalo (5.95±0.63 mg %) than cattle (8.09±1.80 mg %) while phosphorus was lower in cattle (3.18±0.22 mg%) than buffalo (3.42±0.41 mg%). Calcium/phosphorus ratio was higher in cattle (2.54) than buffalo (1.74).

Lower serum levels of calcium and phosphorus in the infertile bulls seem to be of physiological origin as all the bulls were kept in similar managerial conditions in terms of housing and nutrition. Some studies on the influence of various hormones or plasma calcium and phosphorus have been reported. Al-Qarawi et al. (2000) reported fall in the levels of circulating testosterone in camel parallels to the fall in the level of macro elements in the testes and accessory organs and the increase in testosterone concentration at puberty was correlated with calcium level in epididymis. In the male chicken (Attai et al., 1999), calcium administration increased blood levels of testosterone, FSH, prolactin, oestradiol 17-B and thyroid stimulating hormone. In the caribou (Moen et al., 1998), calcium and phosphorus are required to stimulate antler growth and are resorbed from bone during peak antler growth. The depressing effect of stress hormone (corticosterone) on plasma concentration of calcium and phosphorus in male fowl was reported by (Nasir et al., 1999).

The species differences in calcium and phosphorus may be due to the different level of various hormones and enzymes in cattle and buffalo. Lower levels of calcium and higher phosphorus in buffalo than cattle may be due to the fact that calcium and phosphorus are reciprocally related to each other at organ level (Gwathorne et al., 1982; Al-Qarawi et al., 2000) and blood plasma (Hays and Swenson, 1996).

To conclude, serum calcium and phosphorus were lower in infertile cattle and buffalo bulls than fertile ones. The reasons may be genetic or physiological. Further metabolic differences may be studied and mineral supplementation tried to solve this endemic problem.

REFERENCES