SELECTED CLINICO-BIOCHEMICAL PARAMETERS IN THE PUERPERAL PERIOD OF GOATS

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Selected biochemical parameters were observed in the puerperal period of goats, raised under our conditions. The blood samples were collected from v. jugularis on days 1, 3, 7, 14, 21, 28, 36, and 40 after parturition. A significant decrease in the concentrations of sodium with their lowest values was recorded on day 28 post partum. By the end of the evaluated period, their values did not significantly change and were within the range of 146.8 ± 5.52 to 149.3 ± 1.24 mmol.l⁻¹. In the puerperal period, the concentrations of potassium did not show a statistical significance. Their lowest values found on days 3 and 32 did not exceed the limit of the reference values. The mean concentrations of calcium in the evaluated period (1.73 ± 0.20 – 1.95 ± 0.06 mmol.l⁻¹) ranged under the limit of the reference values. Statistically significant values of phosphorus were not found in the puerperal period. The values of magnesium ranged from 0.89 ± 0.11 to 1.00 ± 0.14 mmol.l⁻¹. During the whole puerperal observation, the mean values of total cholesterol were from 2.06 ± 0.43 to 2.75 ± 0.01 mmol.l⁻¹. There was a statistically significant decrease in total lipids on day 7 post partum, with the lowest values of 1.76 ± 0.16 g.l⁻¹. During next days of the postpartum period, their concentrations were under the level of reference values. A statistically significant increase was recorded in total lipids on day 40 post partum. Their dynamics in the evaluated period did not change and ranged within 65.39 ± 2.57 – 71.79 ± 1.55 g.l⁻¹. The concentrations of the biochemical parameters observed in the postpartum period in goats raised under our conditions are discussed.

Key words: goat, puerperium, proteins, cholesterol, lipids, sodium, potassium, calcium, magnesium, phosphorus.

Metabolism of mineral substances, which belongs to the basic components of the inside environment, plays a significant role in the regulation of physiological functions of the puerperal period. Their concentrations in the blood circulation represent homeostatic mechanisms that are in a close relationship with the neurohumoral regulation. The differences in the concentrations of Na and K at the time of early and late pregnancy in a relationship to season were recorded in Marwari sheep (17). Significant differences between Bahri and Rahmani sheep in various seasons were reported by Okab et al. (19). Kudláč (15) recorded the dynamic changes in the ratio of Ca and P in a relationship to cow fertility. Concentrations of Ca and P in the blood...
serum of pregnant women were observed by Brommage and Baxter (3). Jelínek et al. (9) monitored these parameters in fattening Merino sheep during the whole year. Selected parameters of the mineral profile in Slovak Merino sheep in the individual phases of their reproduction cycle were evaluated by Krajničáková et al. (12) and a significant increase in the values was found from insemination to the 3rd month of pregnancy. Similar dynamics was recorded by Massányi et al. (18) in the rabbit.

The postpartum increase in the levels of cholesterol in the peripheral blood of cows to day 56 of the observed period was reported by Bekeová et al. (2). A decrease in the concentration of cholesterol brings a decrease in the low-dense proteins, whose metabolism is closely connected with the effect of estrogens (4). Krokavec et al. (14) reported the study of the metabolic profile parameters in goats during the whole year. Dependence of some biochemical parameters in the blood serum of goats on the phase of reproduction cycle was reported by Aldásy et al. (1), and on supplementary protein diet in Angora goats by Gregoire et al. (5).

The aim of our work was to find the extent of changes in selected clinicobiological parameters in the blood serum during the postpartum period of goats raised under our conditions.

Material and Methods

Animals. Fifteen White short-tailed primiparous goats, aged 2–3 years, were involved into the observation. The animals were raised under the conditions of yield breeding. The food ration consisted of meadow hay (1.5 kg), concentrates (250 g), straw (1.5 kg), root crops (300 g). Mineral licks containing trace elements (Se, Zn, J, Cu, Co, Mg) and water were given ad libitum.

Blood sampling. The blood samples were collected from v. jugularis on days 1, 3, 7, 14, 21, 28, 32, 36, and 40 post partum. The serum, after centrifugation, was stored in single test tubes at –18°C until processing.

Laboratory analyses. The concentrations of Na, K, Ca, Mg were determined in the blood serum by the flame spectrophotometry (acetylene, air) using the AANALYST 100, PERKIN ELMER Co. The automatic biochemical analyser ALYZE, LISA-BIO Co., test Bio MÉRIEUX was used for the photometric determination of P concentrations. Analyses of total proteins (TP), total lipids (TL) and total cholesterol (CHOL) were carried out by BIO-LACHEMA Tests, LACHEMA, Inc. Brno, Czech Republic and read spectrophotometrically at the determined wavelength.

Statistical evaluation. A statistical significance of the parameters evaluated at the individual time intervals was compared to the day 1 after parturition. The Student t-test was used for the result evaluation.

Results and Discussion

The evaluation of Na concentrations (Table 1) in comparison with day 1 post partum showed a statistically significant decrease (P < 0.05) with the lowest values on day 28 after parturition. The levels did not significantly change to the end of the evaluated period and ranged from 146.8 ± 5.52 to 149.3 ± 1.24 mmol.l⁻¹. Our results were comparable to the data obtained in fertilized sheep in winter season (19), and in sheep after parturition (9). A slightly decreasing tendency of Na levels in our animals
could be in connection with increased passage of Na to milk and with changes in its contents in the uterine wall. This fact is also supported by other data (23, 13, 15).

Concentrations of K (Table 1) did not show a statistical significance of differences in the evaluated period (\( P > 0.05 \)). Their insignificant decrease on day 3 (4.76 ± 0.37 mmol.l\(^{-1}\)) with the lowest values on day 32 (4.68 ± 0.22 mmol.l\(^{-1}\)) did not exceed the limit of reference values. Like in Na concentrations, there were not pronounced changes in its levels post partum. The K dynamics in goats post partum, which ranged from 4.68 ± 0.22 to 5.23 ± 0.16 mmol.l\(^{-1}\), is similar to that in postpartum sheep reported by Krajničaková et al. (12).

### Table 1

The mean concentrations of selected parameters of mineral substances in the puerperium of goats

<table>
<thead>
<tr>
<th>Days post partum</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>P</th>
<th>Mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>150.8 ± 5.19</td>
<td>4.88 ± 0.92</td>
<td>1.83 ± 0.19</td>
<td>1.64 ± 0.32</td>
<td>0.89 ± 0.11</td>
</tr>
<tr>
<td>3.</td>
<td>149.0 ± 3.92</td>
<td>4.76 ± 0.37</td>
<td>1.73 ± 0.20</td>
<td>1.53 ± 0.54</td>
<td>0.91 ± 0.11</td>
</tr>
<tr>
<td>7.</td>
<td>150.8 ± 1.52</td>
<td>4.79 ± 0.31</td>
<td>1.95 ± 0.06</td>
<td>1.62 ± 0.39</td>
<td>0.95 ± 0.15</td>
</tr>
<tr>
<td>14.</td>
<td>150.0 ± 2.07</td>
<td>4.90 ± 0.46</td>
<td>1.81 ± 0.19</td>
<td>1.54 ± 0.35</td>
<td>0.91 ± 0.10</td>
</tr>
<tr>
<td>21.</td>
<td>149.2 ± 2.76</td>
<td>4.91 ± 0.53</td>
<td>1.89 ± 0.24</td>
<td>1.55 ± 0.45</td>
<td>0.95 ± 0.13</td>
</tr>
<tr>
<td>28.</td>
<td>144.0 ± 1.26*</td>
<td>4.92 ± 0.28</td>
<td>1.88 ± 0.21</td>
<td>1.44 ± 0.54</td>
<td>0.96 ± 0.10</td>
</tr>
<tr>
<td>32.</td>
<td>148.0 ± 3.26</td>
<td>4.68 ± 0.22</td>
<td>1.83 ± 0.26</td>
<td>1.38 ± 0.56</td>
<td>0.95 ± 0.15</td>
</tr>
<tr>
<td>36.</td>
<td>146.8 ± 5.52</td>
<td>4.82 ± 0.36</td>
<td>1.86 ± 0.14</td>
<td>1.28 ± 0.98</td>
<td>1.00 ± 0.14</td>
</tr>
<tr>
<td>40.</td>
<td>149.3 ± 1.24</td>
<td>5.23 ± 0.16</td>
<td>1.91 ± 0.16</td>
<td>1.91 ± 0.36</td>
<td>0.90 ± 0.05</td>
</tr>
</tbody>
</table>

Statistical significance (*\( P < 0.05 \)), compared to day 1 after parturition.

The mean values of Ca are presented in Table 1. Its concentrations in the observed period ranged under the lower limit of reference values (1.73 ± 0.20 – 1.95 ± 0.06 mmol.l\(^{-1}\)). A decrease in its concentrations is characteristic in the puerperal period (15). The withdrawal of Ca depots from the mother blood to the foetus runs already in the individual stages of its development. A slight and characteristic decrease Ca levels in cow puerperium reported Haraszti et al. (7) and Ivanov (8). The authors suggest that its decrease is connected with the passage to milk at the time of lactation. The excessive decline of Ca in the puerperal period in lactating goats in our experiment confirms the findings of the authors. Hypocalcaemia in the puerperal period of goats can be related with the number of born and suckling kids. We may state that Ca supply into the organism was sufficient, the lactating goats were in good condition and the kids were vital with daily weight gain of 200–250 g.

Concentrations of P in the observed period ranged from 1.28 ± 0.98 to 1.91 ± 0.36 mmol.l\(^{-1}\). The differences compared to the day 1 post partum were not statistically significant (\( P > 0.05 \)). Similar findings were reported by Jelinek et al. (9) during the whole year. Lippmann and During (16) found in winter and spring seasons the mean values of 1.29 ± 0.35 mmol.l\(^{-1}\) of inorganic P.

The mean values of Mg (Table 1) in the puerperal period ranged from 0.89 ± 0.11 to 1.00 ± 0.14 mmol.l\(^{-1}\) and they are in coincidence with the data of Vrzgula et al. (22) in goats. Similar dynamics of mean values of Mg during the year was recorded in
the puerperal period by Jelínek et al. (9) in sheep. The results are in accordance with biological significance and assertion at the activation of enzymes (22).

Concentrations of mean values of total cholesterol are summarized in Table 2. The ranged values between day 1 and 7 from 2.14 ± 0.29 to 2.30 ± 0.51 mmol.l\(^{-1}\). Following a slight insignificant decrease (P > 0.05) on day 14 post partum, the mean concentration of total cholesterol had an increasing tendency to the end of the observed period, and ranged from 2.18 ± 0.53 to 2.75 ± 0.61 mmol.l\(^{-1}\). The dynamics of changes in the decrease in the total cholesterol concentration before parturition and increase in its levels to day 56 after parturition in cows was recorded by Bekeova et al. (2). The increasing tendencies of cholesterol in the puerperal period come out of the fact that cholesterol is a basic substrate of initial source of the ovary steroidogenesis, which recovers already from day 10 post partum. If we come out of the fact that cholesterol has a role of the fatty acid carrier at the milk synthesis (20), then it seems that during the lactation period the cholesterol concentrations are under control of the whole complex of factors (21).

### Table 2

Mean concentrations of total proteins, cholesterol and lipids in the puerperal period of goats

<table>
<thead>
<tr>
<th>Days post partum</th>
<th>Total proteins (TP – g.l(^{-1}))</th>
<th>Total cholesterol (CHOL – mmol l(^{-1}))</th>
<th>Total lipids (TL – g.l(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65.48 ± 3.15</td>
<td>2.21 ± 0.30</td>
<td>2.16 ± 0.25</td>
</tr>
<tr>
<td>3</td>
<td>69.66 ± 5.58</td>
<td>2.14 ± 0.29</td>
<td>1.99 ± 0.42</td>
</tr>
<tr>
<td>7</td>
<td>67.68 ± 3.86</td>
<td>2.30 ± 0.51</td>
<td>1.76 ± 0.16 **</td>
</tr>
<tr>
<td>14</td>
<td>65.00 ± 3.16</td>
<td>2.06 ± 0.43</td>
<td>1.90 ± 0.36</td>
</tr>
<tr>
<td>21</td>
<td>65.39 ± 2.57</td>
<td>2.18 ± 0.53</td>
<td>2.1 ± 0.45</td>
</tr>
<tr>
<td>28</td>
<td>66.86 ± 4.72</td>
<td>2.53 ± 0.47</td>
<td>2.07 ± 0.29</td>
</tr>
<tr>
<td>32</td>
<td>67.47 ± 5.10</td>
<td>2.75 ± 0.61</td>
<td>1.93 ± 0.24</td>
</tr>
<tr>
<td>36</td>
<td>66.36 ± 3.93</td>
<td>2.59 ± 0.63</td>
<td>2.27 ± 0.40</td>
</tr>
<tr>
<td>40</td>
<td>71.79 ± 1.55*</td>
<td>2.63 ± 0.26</td>
<td>2.12 ± 0.20</td>
</tr>
</tbody>
</table>

*P < 0.05;  **P < 0.01 - statistical significance compared to day 1 post partum.

A statistically significant decrease (P < 0.01) in total lipid level (Table 2) was recorded on day 7 (1.76 ± 0.16 g.l\(^{-1}\). By the end of the observed period, the range of their values was from 1.90 ± 0.36 to 2.27 ± 0.40 g.l\(^{-1}\). Based upon the evaluation of the concentrations of total lipids, it can be seen that they ranged in the observed period under the limit of reference values. Concentrations of this metabolite are supposed to be connected with the inhibition of apoprotein synthesis and number of their receptors, which are important for the formation of lipoproteins of very low density at progesterone production (6). Similar results were recorded in sheep post partum (11).

A statistically significant increase in total proteins (Table 2) was recorded on day 40 post partum (P < 0.05). At the beginning of the postpartum period, their concentrations ranged within the reference values (65.00 ± 3.16 – 69.66 ± 5.58 g.l\(^{-1}\)). A decrease in total proteins by the end of the first month post partum, at the time of maximal lactation of sheep, was reported by Jelínek et al. (9) and Krajničáková et al.
Our results of total proteins in the puerperium of goats are in accordance with those observed by Jelínek et al. (9) in the first month of sheep lactation. Based upon the evaluation of changes in selected metabolic parameters and mineral profile, we judge that in the course of changes in the puerperal period there is an increase in the demands for regulatory mechanisms, which are responsible for involution and tissue processes of the sex apparatus and the whole organism of an animal, for mineral saturation as well as for the metabolism level.

References