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The proceedings present the results of current scientific research on the treatment and prevention of animal diseases across the following fields: diagnosis and therapy of animals; veterinary obstetrics and gynecology; veterinary surgery; veterinary pharmacology and toxicology; human and animal physiology; parasitology and entomology; animal hygiene and veterinary sanitation; veterinary and sanitary examination; veterinary microbiology, epizootiology, infectious diseases, and immunology; and pathology, oncology, and morphology of animals. The abstracts are presented as submitted by the authors.

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СУЧАСНІ АСПЕКТИ ЛІКУВАННЯ І ПРОФІЛАКТИКИ ХВОРОБ ТВАРИН

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TOTAL CALCIUM METABOLISM AND ITS FRACTIONS IN THE BLOOD SERUM OF CLINICALLY HEALTHY LACTATING GOATS

Introduction. Goat farming is one of the rapidly developing sectors of livestock production worldwide. Over the past 50 years, the global goat population has increased by 240%, whilst the populations of other farm animal species have remained relatively stable (Nguyen et al., 2023). Interest in this sector in Ukraine has grown significantly due to the import of breeding stock, the establishment of new farms and increased demand for goat's milk and its processed products (Fedorovych et al., 2022).

Total calcium in animal blood serum is an informative biochemical indicator, the physiological optimum of which for clinically healthy goats lies within a fairly narrow range of 8.8 to 11.6 mg/%, equivalent to 2.20–2.90 mmol/L (Hotsuliak & Sakhniuk, 2024). This essential macromineral plays not only a structural but also a functional role; in particular, it is involved in blood clotting, enzyme activation, the functioning of the hypothalamic–pituitary system, membrane permeability and neuromuscular transmission. As bones are the body's main calcium store, changes in its homeostasis directly affect the processes of skeletal formation and resorption. Given that over 99.0% of calcium is stored in the form of hydroxyapatite crystals in bone tissue, its homeostasis is maintained through the regulation of a small proportion (1.0%) of this macromineral circulating in the extracellular fluid (Murray & Wolf, 2023).

The aim of this study was to investigate the metabolism of total calcium and its fractions in the blood serum of clinically healthy lactating goats.

Materials and methods. The study was carried out on dairy goats aged 2–5 years. The study involved animals at various stages of lactation (days 0–2, 15–25 and 50–60 of lactation). Total calcium, ionised calcium and protein-bound calcium were determined in the blood serum of lactating goats using standardised methods. Measurements were carried out using a Stat Fax 4500+ biochemical analyser («Awareness Technology Inc.», USA). The concentrations of the ultrafiltration and neutral fractions of the macroelement were calculated mathematically (Levchenko et al., 2010).

The results of the biochemical analyses are presented in accordance with the International System of Units (SI). The results of the laboratory blood tests were analysed statistically using the «Statistika-12» software. The arithmetic mean (M) and the standard error of the mean (m) were determined. Statistically significant differences were assessed using Student's t-test. Results were considered statistically significant at $p<0.05$; 0.01; 0.001 (Petrovska et al., 2022).

Research results. The study was conducted on dairy goats. The physiological reference ranges for total calcium and ionised calcium concentrations in goat serum were taken as 2.20–2.90 mmol/L and 0.47–1.20 mmol/L, respectively (Hotsuliak & Sakhniuk, 2024).

We studied the metabolism of total calcium and its individual fractions in 175 clinically healthy lactating goats on days 0–2, 15–25 and 50–60 after kidding. It was found that the concentration of this macroelement in the goats' blood serum ranged from 2.20 to 2.87 mmol/L. In particular, on days 0–2 after kidding, its concentration ranged from 2.22 to 2.74 mmol/L and did not differ from that of non-lactating animals. On days 15–25 of lactation, the macromineral concentration in the animals ranged from 2.21 to 2.87 mmol/L. On days 50–60 post-parturition, its

concentration ranged from 2.20 to 2.83 mmol/L and showed no significant difference compared with previous periods of lactation.

The concentration of ultrafiltrated calcium in the blood serum of clinically healthy lactating goats fell within a wide range – from 1.17 to 2.40 mmol/L, whilst its proportion of total calcium was 77.9%. For example, on days 0–2 post-kidding, the level of this fraction in the animals ranged from 1.17 to 2.40 mmol/L and was significantly lower compared with goats at 120–140 days of gestation ($p<0.001$). On days 15–25 of lactation, the concentration of the ultrafiltrated calcium fraction in the blood serum of lactating goats ranged from 1.23 to 2.37 mmol/L and was 18.6% lower than in animals on days 0–2 post-kidding ($p<0.001$). On days 50–60 after kidding, the concentration of this form of calcium ranged from 1.57 to 2.20 mmol/L and was significantly higher compared with animals from the previous study period ($p<0.01$; $p<0.01$).

The concentration of ionised calcium in the blood serum of clinically healthy lactating goats ranged from 0.47 to 1.30 mmol/L (44.7%/ultrafiltered Ca; 35.1%/total Ca). For example, on days 0–2 after kidding, its level ranged from 0.47 to 1.24 mmol/L, which is 1.15 times lower than in animals in the second stage of gestation ($p<0.001$). On days 15–25 after kidding, the free calcium fraction in the animals showed a slight upward trend compared with the previous study period, ranging from 0.49 to 1.30 mmol/L. On days 50–60 of lactation, the concentration of ionised calcium in goats ranged from 0.47 to 1.30 mmol/L and showed a marked tendency to increase (by a factor of 1.1 and 1.06), compared with animals at days 0–2 and 15–25 of lactation ($p<0.05$; $p<0.1$).

The level of the neutral calcium fraction in the blood serum of lactating goats ranged from 0.21 to 1.79 mmol/L, and its proportion in the composition of ultrafiltrated calcium and total calcium was 53.2% and 41.4%, respectively. For example, on days 0–2 post-kidding, the concentration of this form of the macromineral in the serum of lactating goats ranged from 0.40 to 1.79 mmol/L and was significantly higher compared with animals at 120–140 days of gestation ($p<0.001$). On days 15–25 of lactation, its concentration in goats ranged from 0.21 to 1.57 mmol/L and was significantly lower compared with animals on days 0–2 post-kidding ($p<0.001$). On days 50–60 of lactation, the concentration of the neutral form of calcium in goats ranged from 0.32 to 1.48 mmol/L and was almost indistinguishable from the mean value in goats on days 15–25 of lactation, but was significantly lower than that in animals on days 0–2 post-kidding ($p<0.001$).

The concentration of the protein-bound fraction of calcium in lactating goats ranged from 0.16 to 1.29 mmol/L, and its proportion of total calcium was 22.1%. In particular, on days 0–2 after kidding, its concentration ranged from 0.16 to 1.05 mmol/L and was significantly lower compared with animals at 120–140 days of gestation ($p<0.001$). On days 15–25 of lactation, the concentration of this fraction in the blood serum of goats ranged from 0.25 to 1.29 mmol/L, which was significantly higher compared with animals on days 0–2 post-kidding ($p<0.001$). On days 50–60 after kidding, its concentration in goats varied widely, ranging from 0.30 to 0.98 mmol/L, which was 39.8% lower than in animals on days 15–25 after kidding ($p<0.001$).

Conclusions. In the blood serum of clinically healthy lactating goats, the concentration of total calcium ranged from 2.20 to 2.87 mmol/L; that of ultrafiltrated calcium from 1.17 to 2.40 mmol/L; ionised calcium – 0.47–1.30 mmol/L; neutral calcium – 0.21–1.79 mmol/L; protein-bound calcium – 0.16–1.29 mmol/L.

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