CONTEMPORARY AGRICULTURE / *SAVREMENA POLJOPRIVREDA* 60 (1-2) 31-37, 2011.
UDC: 63(497.1)(051)-"540.2" ISSN 0350-1205

UDC: 612.123:637.1

SOME BIOCHEMICAL BLOOD PARAMETERS OF GATACK BREED COWS FROM GACKO REGION

ĐORĐE SAVIĆ, STOJA JOTANOVIĆ, MILANKA DRINIĆ, MARINKO VEKIĆ[1]

SUMMARY: In this paper are presented values of biochemical parameters of blood of 11 Gatačko breed cows in different reproductive or production stages and the results of food analysis. Hyperproteinemy and hyperglobulinemy were found in all, and hyperalbuminemy was found in 8 tested animals (72.72%). The concentration of urea below the lower physiological limit was found in 8 animals (72.72%) (mean value 6,06±0,54 mmol/L). The cholesterol concentration in 9 animals (81.81%) was above the upper physiological limit (mean value 4,16±0,42 mmol/L). Hyperbilirubinemy was found in all tested animals (mean value 25,55±2,62 mmol/L). Calcium blood level was below the lower physiological limit in 4 animals (36.36%). Phosphorous blood level was below the lower physiological limit in one animal (9.09%), and above the upper physiological limit in remaining 10 (91.91%). ALT activity was elevated in 10 animals (91.91%) (mean value 71,27±4,64 U/L). The average activity of AST was within physiological values, and the increase was found in 5 animals (45.45%). Analysis of the meal showed that meal was insufficient for animals in crude protein and energy content.

Key words: *Gatack breed cattle, blood, biochemical parameters.*

INTRODUCTION

Analysis of biochemical blood parameters is used as valuable indicator of health and productive potential of the individual. Its task is to reach a conclusion about the health and metabolic status of cows, based on the values and attitudes of certain constituents of blood. Data on the values of blood biochemical parameters for high-yielding milk cows are available in the literature, while such data for the indigenous breeds (Busha, Podolsko and Gatačko cattle) are rare and unsufficient.

Most authors agree that for the evaluation of metabolic status of animals it is necessary to determine the parameters that indicate energy status (concentrations of glucose, urea, triglycerides and cholesterol), functional state of the liver (liver enzyme activity, concentrations of albumins, globulins, total protein and bilirubin) and mineral

---

Original scientific paper / *Originalni naučni rad*
[1]Đorđe Savić, BSc Vet. Med., Assistant, dr Stoja Jotanović, PhD, Assistant Professor, dr Milanka Drinić, PhD, Assistant Professor,, MSc Marinko Vekić, Assistant, University of Banjaluka, Faculty of Agriculture, Bulevar vojvode Petra Bojovića 1a, Banjaluka, Bosnia and Herzegovina
Corresponding author: Đorđe Savić, Bulevar vojvode Petra Bojovića 1a, 78.000 Banja Luka, BiH, phone + 387 51 330 952, e-mail: djordjevet@yahoo.com

metabolism (calcium and phosphorus blood levels) (Brugere-Picoux and Brugere, 1987; Radojičić et al., 2002; Stojević et al., 2002; Ivanov et al., 2005).

Blood plasma and serum contain about 60-80 g/L of proteins, and albumins comprise 35-50% of that (Kaneko et al., 2008). Albumins are indicators of functional status of liver and nitrogen supply (Roil et al., 1974; Radojičić et al., 2002; Stojević et al., 2002; Ivanov et al., 2005). Hiperalbuminemy occurs most often in relation to dehydration, hemoconcentration and magnesium deficiency, and hipoalbuminemy with impairing of morphological and functional integrity of liver, kidney and gastrointestinal disorders, blood loss, malnutrition and parasitoses, firstly distomatosis (Brugere-Picoux and Brugere, 1987; Ivanov et al., 2005; Kaneko et al., 2008; Stojević et al., 2008). The increasing the globulin concentration comes with infections and tumors appearance, and reducing with the deficiency of cobalt, magnesium, copper and iron, malnutrition and parasitoses (Brugere-Picoux and Brugere, 1987; Ivanov et al., 2005). The concentration of total protein in blood serum can be reduced by anemia, malnutrition and morphological and functional disorders of liver, and increased by dehydration and chronic infections (Brugere-Picoux and Brugere, 1987; Ivanov et al., 2005, Kaneko et al., 2008).

The activity of liver enzymes in blood serum is an important diagnostic parameter of morphological and functional state of liver. According to many authors (Radojičić et al., 2002; Stojević et al., 2008; Kaneko et al., 2008), levels of aspartate-aminotransferase (AST) and alanine-aminotransferase (ALT) are commonly used as an indicator of morphological and functional state of liver. In dairy cows, increase of AST and GGT (gamma-glutamyl transpherasis) is usually associated with fatty liver, reduced appetite and the appearance of ketosis in early lactation (Cebra et al., 1997; Steen, 2001; Stojević et al., 2002; Stojević et al., 2008). The increased concentrations of cholesterol may also indicate hepatocyte damage. The concentration of bilirubin is a very important factor to evaluate detoxificative function of liver, and its increase comes as a result of massive hemolysis or liver damage (Stojević et al., 2002; Ivanov et al., 2005; Horvat et al., 2007; Stojević et al., 2008).

The concentration of urea in the blood is an important indicator of nitrogen and energy supply. Its decrease comes with protein deficiency, especially in the combined energy and protein deficiency, and its increase comes with the surplus of protein, with an absolute or relative lack of energy (Stamatović and Jovanović, 1990; Stojević et al. 2002; Horvat et al., 2007). The concentration of calcium and phosphorus in the blood is an indicator of mineral metabolism. Disturbances in their metabolis; Ivanov et al. 2005; Horvat et al., 2007).

This paper presents the values of some biochemical parameters of blood of Gatačko cattle cows at various stages of production and the reproductive cycle (early lactation, late lactation and dry period) as well as their association with health status and results of feed analysis.

MATERIALS AND METHODS

The study included a total of 11 Gatačko cattle cows from individual farming, from Gacko Municipality. Cows were examined during early lactation (15-60 days after calving, n = 7), about 150th day of lactation (n = 2) and about 15 days before dry period (n = 2). Data on the daily milk production were not collected regularly, but, according to data obtained from the owner, the average daily milk yield at the peak of lactation

ranged from 12-18 liters. Age of animals ranged from 2 to 11 years, and body weight between 400 and 500 kilograms. Blood and feed samples were taken during January and February 2010. when the animals stayed indoors (the period of winter feeding).

All cows were kept in usual environmental conditions for the region (indoors in winter and on pasture in summer). The barns are modest in terms of environmental conditions, buried in the ground, with no light and manure cleaning system. Bearings are the long type, with the use of bedding. In winter, cows are feed only with hay, usually four times a day (about 12 kg of hay per day). Animal get bran only a couple of days after calving, usually blurred in the warm water. Except allready mentioned, cows do not get other feed. Cows are given salt twice a week (hand of salt per cow). They usually drink water once a day, and the amount of water drunk ranges from 30-40 liters. In two barns there were automatic drinkers. Animals were clinically healthy, and, according to data obtained from the owner, had regular reproductive cycle.

Blood samples were taken from all tested animals, by puncture of v. coccigea, in sterile vacutainers without anticoagulant. The samples were left at room temperature for spontaneous coagulation. Blood serum was separated by centrifugation and frozen until analysis. Along with taking blood samples, hay samples were taken for chemical analysis.

Analysis of blood biochemical parameters was performed in The Veterinary Institute of Republic of Srpska "Dr Vaso Butozan" in Banja Luka, on a biochemical analyzer VetTest Chemistry Analyzer, IDEXX Laboratories, UK. In the blood samples we determined following biochemical parameters: concentrations of albumin, globulin, total protein, total bilirubin, urea and cholesterol, activity of AST and ALT, calcemy and phospahatemy. Feed analysis was carried out at The Agricultural Institute of Republic of Srpska, by using standard methodology. The hay samples were analyzed for the following parameters: dry matter content, ash, crude protein, fiber, calcium and phosphorus. On that basis, the energy and nutrient value of ration was calculated.

The results were statistically analyzed and presented in tables.

RESULTS AND DISCUSSION

The results of blood biochemical parameters of tested animals are shown bellow in Table 1.

Table 1. Values of biochemical blood parameters of observed animals (n=11)
Tabela 1. Vrijednosti biohemijskih parametara krvi ispitanih životinja (n= 11)

Parameter/*Parametar*	**M**	**SD**	**SE**	**CV**	**IV**
Total protein / *Ukupni proteini* (g/L)	94.36	9.86	2.97	10.45	79-110
Albumines / *Albumini* (g/L)	40.55	4.50	1.36	11.10	35-47
Globulines / *Globulini* (g/L)	53.91	7.87	2.37	14.59	43-69
ALT /*ALT* (U/L)	71.27	15.39	4.64	21.59	38-86
AST / *AST* (U/L)	129.45	23.39	7.05	18.07	88-182
Total bilirubin / *Ukupni bilirubin* (µmol/L)	25.55	8.70	2.62	34.05	13-37
Cholesterole / *Holesterol* (mmol/L)	4.16	1.40	0.42	33.63	2.74-7.96
Urea / *Urea* (mmol/L)	6.06	1.79	0.54	29.60	3.70-8.60
Calcium / *Kalcijum* (mmol/L)	2.50	0.22	0.06	8.68	2.20-2.96
Phosporus / *Fosfor* (mmol/L)	2.38	0.39	0.12	16.55	1.55-2.89
Calcium-phosporus ratio / *Odnos kalcijuma i fosfora*	1.08	0.20	0.06	18.64	0.79-1.58

According to our knowledge, research for determination of physiological values of blood biochemical parameters for this breed was not conducted so far, so we took data from the relevant literature as reference values *(Kaneko et al., 2008).* The average concentration of albumin was 40.55 ± 1.36 g / L, which is significantly higher compared to the reference values (30.3 to 35.5 g / L). A similar situation is with the concentrations of globulin (53.91 ± 2.37 g / L) and total protein (94.36 ± 2.37 g / L). Bearing in mind that hyperproteinemy was present in all tested animals, lack of drinking water (according to data obtained by Grubić and Adamović, 1998, daily needs of cattle weighted 450 kilograms amount to about 55 liters of water), and the fact that tested animals were fed only with dry forages (hay), elevated concentrations of proteins can be considered as a consequence of hemoconcentration due to unfavorable balance of water. The fact that there was no significant change of albumin to globulin ratio, as well as the relatively large loss of water through the milk confirms this claim. As a potential cause of hyperproteinemy we should not neglect the small liver fluke larvae, which had resulted in the development of chronic cholangitis and hepatitis, which prompted the synthesis of antibodies and increase the concentration of total protein.

ALT activity in one tested cow (9,09%) was within the reference interval, while in the others it was above the upper reference limit (average 71.27 ± 4.64 U / L). Similar to ALT, AST activity was also elevated, but the average value remained within the reference values (129.45 ± 7.05 U / L). At the same time in 5 animals (54.54%) had values above the upper physiological limit. Elevated liver enzyme activity indicates presence of hepatocyte damage, probably due to mechanical damage of liver by parasites. In addition to that, a high concentration of total bilirubin was found in all tested animals (average 25.55 ± 2.62 mmol / L), and it was almost three times higher than the upper reference limit (0.17 to 8.55 mmol / L). Having in mind relatively low milk yield of tested cows, it can be said that in these cows lipomobilisation is not developed, so that it is not the main reason for increased bilirubin concentrations. In interpreting the results we should not neglect the fact that the samples came from animals who live at an altitude of 1000 to 1300m, and therefore it can be expected that their red blood cells number and hemoglobin (and consequently bilirubin) concentration would be at the upper physiological limit. Concentrations of total cholesterol values were within the reference interval in only two animals (18.18%), while in others the value was above the upper physiological limit. The average concentration of cholesterol (4.16 ± 0.42 mmol / L) was above the upper physiological limit, which indicates the presence of damage of liver by small liver fluke larvae, so the damaged hepatocytes can not accept and use the blood cholesterol that comes from fat tissue.

The concentration of urea in the blood of three tested animals (27.27%) was within reference values (7.14 to 10.70 mmol / L), while in the others it was below lower range. The same situation is with the average value, which amounted to 6.06 ± 0.54 mmol / L. From this finding it can be concluded that the meal did not contain enough digestible crude protein and energy. Chemical analysis showed that the protein content in the ration was reduced by about 50%, and energy content by 42% compared to the norms (Adamović and Grubić, 1998), which prevents the binding of ammonia and its incorporation into microbial protein. High cellulose content (35.6%) indicates that hay was not stored at the optimal time, but considerably later, when hay stalk was indurated with celulose-lignine complex, which reduces digestibility and energy value of ration.

Calcium concentration value below the lower physiological limit was registered at 4 animals (45.45%). One animal (9.09%) had a phosporus concentration value below lower, while the others had values above the upper physiological limit. Average values of calcium and phosporus concentration were within and above the reference value, respectively, which indicates that the disorder of mineral metabolism is present. This claim is confirmed by the calcium-phosphorus ratio, that ranged from 0,79:1 to 1,58:1 (average 1.08 ± 0,06:1), which can be considered as unfavorable ratio (based on physiological values, the optimum ratio of calcium and phosphorus in the blood serum is approximately 1,25:1). The ratio of calcium and phosphorus in the ration was disturbed in favor of calcium (2,4:1), and in blood serum in favor of phosphorus which can be attributed to higher digestibility of phosphorus relative to calcium, as well as the significant excretion of calcium through milk in relation to phosphorus.

CONCLUSION

Previous researches for determining reference values of biochemical parameters of blood were mainly focused on the high-productive breeds, while the data on indigenous breeds are unavailable.

Based on the presented data it was found that tested animals had damaged liver, most probably as a result of parasitic invasion of the small fluke larvae, which was manifested by a reduced ability of bilirubin excretion and increased liver enzyme activity. The facts that most of the year animals spend on pasture, and that the owners do not conduct regular dehelmintisation was confirming the dicroceliosis as one of the main causes of liver damage. However, despite the liver damage, its functional capacity was significantly preserved, which was indicated by physiological or even slightly elevated concentrations of albumin. Mineral status of tested cows indicates disturbed ratio of calcium and phosphorus in blood and the ration, and low concentration of urea indicates the deficit of energy and protein in ration, all confirmed by the results of chemical analysis. Drinking water supply of tested animals was insufficient, which results in hemoconcentration and hyperproteinemy.

Bearing in mind the age of tested cows, length of their productive life and relatively high production of milk in rather unfavorable conditions, and generally good health, we come to the conclusion that the Gatačko breed cattle is a very interesting genetic resource, whose development and advancement in the future is needed.

REFERENCE

BRUGERE-PICOUX, JEANE, BRUGERE, H.: Particularities de la biochemie clinique des ruminants. Rec. Vet., Med., 163(11)1043-1053, 1987.

CEBRA, CK, GARRY, D., GETZY, M., FETTMAN, MJ.: Hepatic lipidosis in anorectic, lactating holstein cattle: a retrospective study of serum biochemical abnormalities. J. Vet. Intern. Med., (11)231-237, 1997.

GRUBIĆ, G., ADAMOVIĆ, M.: The high-productive cows nutrition (in Serbian). The Faculty of Agriculture, Belgrade-Zemun, 1998.

HORVAT J., KATIĆ, VERA, ŠAMANC H., KIROVSKI DANIJELA: The health disorders of high-yielding cows in early lactation and their influence on hygienic properties of raw milk (in Serbian). Veterinary Specialistic Insitute Subotica, 2007.
IVANOV, I., ŠAMANC, H., VUJANAC, I., DIMITRIJEVIĆ, B.: Metabolic profile of cows, Proceedings of the 4th Symposium Nutrition, Reproduction, and Health Care of Cattle - Ethiopatogenesis and diagnosis of disorders of cattle reproduction metabolism (in Serbian). Subotica, pp. 241-247, 2005.
KANEKO, JJ, HARVEY, J., BRUSS, M.: Veterinary Clinical Biochemistry of Domestic Animals (Sixth Edition), Academic Press, London, New York, Tokyo, 2008.
RADOJIČIĆ, BILJANA, BOJKOVSKI, J., JANKOVIĆ, D.: Some biochemical parameters in control of metabolism in high-productive cows (in Serbian). Veterinary Journal of Republic of Srpska, 2(1-2)31-35, 2002.
ROIL, MR, SUCKLING, GW, MATTINGLEY, J.: Serum total protein and albumin levels in grazing sheep. N.Z. Vet.J., 22:232-236, 1974.
STAMATOVIĆ, S., JOVANOVIĆ, M.: Diseases of ungulata I - Diseases of cattle (in Serbian). University of Belgrade, The Faculty of Veterinary Medicine, 1990.
STEEN, A.: Field study of dairy cows with reduced apetite in early lactation: clinical examination, blood and rumen analyses. Acta Vet. Scandinavica, 41:219-228, 2001.
STOJEVIĆ, Z., FILIPOVIĆ, NATALIJA, BOŽIĆ, P., TUČEK, J., DAUD, J.: The metabolic profile of Simmental service bulls. Veterinary Archive, 78(2)23-129, 2008.
STOJEVIĆ, Z., MILINKOVIĆ-TUR, S., ZDELAR-TUK, M., PIRŠLJIN, J., GALIĆ, G., BAČIĆ, I.: Blood minerals and metabolites as an indices of metabolic disturbances in dairy cattle. Praxis vet., 50:261-264, 2002.

NEKI BIOHEMIJSKI PARAMETRI KRVI KRAVA GATAČKE RASE IZ REGIJE GACKO

ĐORĐE SAVIĆ, STOJA JOTANOVIĆ, MILANKA DRINIĆ, MARINKO VEKIĆ

Izvod

U radu su date vrijednosti biohemijskih parametara krvi 11 krava gatačke rase u različitim proizvodno-reproduktivnim fazama i rezultati analize obroka. Hiperproteinemija i hiperglobulinemija ustanovljene su kod svih, a hiperalbuminemija kod 8 ispitanih životinja (72,72%). Koncentracija uree ispod donje fiziološke granice ustanovljena je kod 8 životinja (72,72%) (prosječno 6,06±0,54 mmol/L). Koncentracija holesterola kod 9 životinja (81,81%) bila je iznad gornje fiziološke granice (prosječno 4,16±0,42 mmol/L). Hiperbilirubinemija je ustanovljena kod svih ispitanih životinja (prosječno 25,55±2,62 mmol/L). Kod 4 životinje (36,36%) ustanovljena je vrijednost kalcemije ispod donje fiziološke granice. Kod jedne životinje (9,09%) fosfatemija je bila ispod donje, a kod ostalih 10 (91,91%) iznad gornje fiziološke granice. Povišena aktivnost ALT ustanovljena je kod 10 životinja (91,91%), (prosječno 71,27±4,64 U/L). Prosječna aktivnost AST bila je unutar fizioloških vrijednosti, a povišenje je ustanovljeno kod 5 životinja (45,45%). Analiza obroka pokazala je da obrok nije bio usklađen sa potrebama životinja u pogledu sadržaja sirovih proteina i energije.

Ključne riječi: gatačko goveče, krv, biohemijski parametri.

Received / *Primljen*: 23.12.2010.
Accepted / *Prihvaćen*: 24.01.2011.