

THE METABOLIC STATUS OF LACTATING GOATS IN A ROMANIAN DAIRY GOAT FARM

STATUSUL METABOLIC AL CAPRINELOR ÎN LACTAȚIE DINTR-O FERMĂ DE CAPRE DE LAPTE DIN ROMÂNIA

F.I. NEACȘU¹⁾,
Carmen IONIȚĂ^{1),*}, Ana Maria GOANȚĂ¹⁾,
Roxana IGNĂTESCU¹⁾, C. NISTOREL¹⁾,
D.M. NEACȘU¹⁾, L. IONIȚĂ¹⁾

ABSTRACT | REZUMAT

The research presented in this paper was conducted on a dairy goat farm with a herd of 500 animals, Saanen, French Alpine, Carpathian and Banatian White breeds. To evaluate the metabolic status of the animals in the farm, we examined a representative number of animals and collected blood samples from lactating goats at the end of lactation and we determined the major biochemical and haematological parameters that help the veterinarian and the owner to monitor the health of the livestock, using the blood haematology and biochemistry analysers of the Department of Internal Medicine of the Faculty of Veterinary Medicine of Bucharest. We determined that most of the animals had a subclinical disease, both metabolic as well as infectious, and we concluded that the animal's health would improve with minimal improvement in nutrition and surveillance for infectious disease, in particular of the udder and feet.

Keywords: goat, metabolism, farming, metabolic status

Cercetările prezentate în această lucrare au fost efectuate într-o fermă de capre de lapte cu efectivul de 500 animale din rasele Saanen, Alpină franceză, Albă de Banat, Carpatină. În vederea evaluării statusului metabolic am examinat un număr reprezentativ de caprine aflate la sfârșitul perioadei de lactație din fiecare rasă, cărora le-am recoltat probe de sânge pentru a determina anumiți parametri biochimici și hematologici prin care medicul veterinar și proprietarul pot supraveghea sănătatea efectivului de animale, utilizând aparatura de biochimie sanguină și hematologie aflată în dotarea Clinicii Medicală a Facultății de Medicină Veterinară București. Rezultatele obținute au pus în evidență prezența afecțiunilor subclinice, atât de natură metabolică, cât și infecțioasă. În concluzie, recomandăm o îmbunătățire minimală a nutriției în fermă și o mai bună supraveghere a proceselor inflamatorii - infecțioase, în special ale ugerului și picioarelor.

Cuvinte cheie: capre, metabolism, creștere, status metabolic

Goats provide important quantities of milk and meat, recognized as low-cholesterol dietetic products. The economic interest in goats is determined by their lactogenic capacity, 8-20 times their body weight per lactation (6). Organic food is produced in systems that avoid the use of man-made fertilizers, pesticides; growth regulators and livestock feed additives, including irradiation and the use of genetically modified organisms. We consider that goats raised in clear, unpolluted environments, eating and drinking from unpolluted soils can be considered organic, and while goat meat is less consumed in our country; goat milk and its derived products are in high demand (10-13).

Goats valorize plants on pastures and natural meadows from either plains, hills, or mountains, using land that cannot be used for crops. They can also utilize a

wide range of by-products obtained from the bread industry or alcohol, starch, vegetable oil, and sugar factories. The issue of goat nutrition, mainly the type, quantity, and quality of fodder during winter stabling and grazing in the warm season, is one of the factors under the control of the farm owner that can ultimately decide the economic profitability of the exploitation (1-3). In some European countries, effective breeding and nutritional management programs and veterinary surveillance systems have been developed and applied, turning goat farming into an intensive operation that maximizes the lactogenic capacity of the animals.

MATERIAL AND METHODS

The studied farm is one of the most modern goat farms in Romania which raises Saanen, French Alpine, Banatian White, and Carpathian goats. The farm manager believes that both the Saanen and the French Alpine are well suited to the environmental conditions

1) University of Agronomic Sciences and Veterinary Medicine, Faculty of Veterinary Medicine, Bucharest, Romania

*) Corresponding author: ionitacarmen63@yahoo.com

in SE Romania. The goats are stabled year-round and spend several hours a day outside in enclosures. They are fed wheat and barley straw in the evening and commercial goat feed in the morning.

We acquired data through epidemiologic investigations at the farm and identification of risk factors, direct interviews with the goatherds and exploitation manager to obtain the complete history (anamnesis), physical examination and biochemical, and haematological analyses. We examined 15 animals from each breed and collected blood from 10 clinically healthy goats of each breed (no history of the disease and normal physical examination). This article is part of a larger transversal study that gives an overview of the goat farming in different areas of the country, based on quantitative analysis, namely biochemical and haematological determinations and metabolic correlations that result from disorders of the main metabolisms, due to metabolic disorders of a nutritional na-

ture, imposed by the hormonal status of gestation, lactation, or as a result of subclinical microbial infection. The machines we used are the hematology analyser Diatron Hematology Abacus Junior Vet 5 (SUA) and the biochemistry analyser Arkray Spotchem EZ SP4430 (Japan).

RESULTS AND DISCUSSIONS

To determine the health status or pathological conditions of goats on the farm, we collected blood samples from goats of French Alpine, Saanen, Banatian White, and Carpathian breeds. The results are presented in tables 1-4.

In the French Alpine breed, blood was sampled from lactating goats at the end of the lactation period.

Hypoglycemia in the Saanen, French Alpine and Carpathian goats can be considered 'physiological', in the sense that, in ruminants, the normal blood glucose

Table 1

Metabolic changes in French Alpine goats

Parameter	Biochemical alterations	Leukocyte changes	Red blood cell parameters
Lactation	Increased TP, GGT, ALP; decreased GLU	Moderate lymphocytopenia	Decreased RBC, HCT, HB, MCV Increased MCHC
Interpretation	Hepatic disease, hypoglycemia	Clinically insignificant changes	Subclinical microcytic anemia
TP - total protein, GGT - gamma-glutamyl transferase, ALP - alkaline phosphatase, GLU -glucose, RBC - red blood cell, HCT - hematocrit, HB - hemoglobin, MCV - mean corpuscular volume, MCHC - mean corpuscular hemoglobin concentration			

Table 2

Metabolic changes in Saanen goats at the end of the lactation period

Parameter	Biochemical alterations	Leukocyte changes	Red blood cell parameters
Lactation	Decreased GLU, AST, increased GGT, ALKP	Normal	Marked erythropenia
Interpretation	Hypoglycemia; subclinical enteric or hepatic disease	-	Subclinical anemia
AST - aspartate transaminase			

Table 3

Metabolic changes in Banatian White goats during gestation and lactation

Parameter	Biochemical alterations	Leukocyte changes	Red blood cell parameters
Gestation	Increased GGT	Normal	Normal
Lactation	Increased GGT, ALKP, creatinine	Lymphocytosis	Decreased HCT and MCV
Interpretation	Possible subclinical hepatic and renal disease	Inflammation or subclinical chronic infection	Subclinical alterations of RBC parameters

Table 4

Metabolic changes in Carpathian goats

Parameter	Biochemical alterations	Leukocyte changes	Red blood cell parameters
Lactation	Increased GGT, ALKP, decreased GLU	Normal	Decreased MCV
Interpretation	Hepatic disease; hypoglycemia	-	No clinical significance

Table 5

Interpretation of metabolic changes in goats

Breed	Biochemical alterations	Leukocyte changes	Red blood cell parameters
French Alpine	Subclinical hepatic disease	Moderate lymphocytopenia without clinical significance	Subclinical microcytic anemia
Saanen	Hypoglycemia; subclinical enteric or hepatic disease	Normal	Subclinical anemia
Banatian White	Possible subclinical hepatic and renal disease	Inflammation or subclinical chronic infections	Quantitative changes with no clinical significance
Carpathian	Hepatic disease; hypoglycemia	Normal	Quantitative changes with no clinical significance
The results were interpreted using data from Meyer and Harvey, 2004; Ghergariu et al., 2000; Smith and Sherman, 2011; Pugh and Baird, 2012. (5, 9-11).			

is 42-75 mg/dL (5). Ingested carbohydrates are not absorbed through the gastrointestinal tract, but are fermented and absorbed by micro-organisms to enter the microbial anaerobic glycolytic cycle, where a glucose molecule results in two molecules of pyruvate, the resulting energy being incorporated into the synthesis of two ATP molecules and in the reduction of two molecules of NAD to NADH (3). If digestion would take place under aerobic conditions then the resulting pyruvic acid would enter the Krebs cycle. The fermentation of pyruvate/pyruvic acid in anaerobic conditions results in volatile fatty acids (VFA): acetic acid, butyric acid, and propionic acid dissociated as acetate, butyrate, and propionate. VFA is an important energy source for ruminants, similar to glucose; propionate is the only VFA glucose precursor for gluconeogenesis (7, 8).

CONCLUSIONS

Goat nutrition should be improved minimally with the introduction of green alfalfa during summer and alfalfa (lucerne) hay in the winter. Infectious and inflammatory processes should be better monitored for, in particular in organs more at risk for disease (udder and feet). In all lactating animals, irrespective of breed, subclinical liver metabolism disorders can be observed. The leukocytic pattern shows minor changes in the Banatian White. The French Alpine and Saanen goats had small quantitative alterations in the red blood cell parameters but without clinical significance. Biochemical evidence of hypoglycemia is not correlated with obvious clinical conditions; it may be the result of lactation or an unbalanced diet.

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