

A Brief Analysis of the Health Status of Dairy Cows by Determining Serum Biochemical Parameters

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Abstract

The research was carried out to follow the state of health of dairy cattle by determining the biochemical parameters in the serum. Animals of the BNR breed from a farm in the Moldova area were studied and blood samples were collected, later the following serum parameters were analyzed: albumin, alkaline phosphatase (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), cholesterol, gamma-GT, total proteins, triglycerides, and urea. At the same time, the obtained milk production was correlated with the biochemical parameters of bovine serum, thus there were distinctly significant positive correlations between milk production and aspartate aminotransferase (AST), respectively urea, and an insignificant correlation was between milk production and albumin. Following the biochemical analyses, the liver parameters were very slightly above the limit provided by the specialized literature.

Introduction

The original concept of animal welfare, developed over 50 years ago by Brambell (1965), was revised by Lawrence and Stott in 2010. They defined animal welfare as an ethical concern for the mental and physical health of animals, over which humans have some control. However, the definition and measurement of animal welfare remain controversial topics. The relationship between farmers and animals must be considered when setting farm animal welfare standards, and a multidisciplinary approach to welfare assessment is required. Poor environmental conditions can affect several animal functions, reducing productive and reproductive performance. Stressors and poor welfare can compromise animals' immune systems, making them more susceptible to disease. Health is a crucial component of animal welfare, being monitored through hematological and biochemical tests.

Material and method

In order to identify as early as possible any deviation in the activity of the animal's body, it is necessary to carry out a biochemical blood test. The analysis is carried out to identify metabolic disorders in an animal, lack of nutrients in the body. The 15 blood samples were collected 4 to 6 h after milking and feeding from the tail vein into 9 ml clot activator vacutainer tubes. After collection, blood samples were centrifuged for 5 minutes at 3000 rpm in a Hettich Zentrifugen Rotofix 32A Centrifuge and the resulting supernatant is called serum (Figures 1,2). Blood sera were analyzed for the following biochemical parameters: ALT/GPT (Alanine aminotransferase), ALB (albumin), AST/GOT (Aspartate aminotransferase), CHOL (cholesterol), gamma-Gt, TP (total protein), TRIG (triglycerides), BUN (urea) and ALKP (alkaline phosphatase). Analyzes were determined using the BioSystems BA200 analyzer, which features a dynamic baseline with SMART LED technology.



Figure 1. Centrifugation of blood samples



Figure 2. The serum obtained after centrifugation

Results and discussions

Table 1 highlights the statistical estimators resulting from the blood biochemical examination. The animals taken in the study are from the G₁ group, whose milk production means an amount of 31 liters as an average.

Biochemical Parameters	Reference interval (The Merck Veterinary manual)	Statistical estimators				
		\bar{X}	s	CV %	Min.	Max.
Albumin (g/L)	29-39	34.87	3.20	0.09	26	40
ALP-DEA (U/L)	27-127	87.33	17.51	0.20	62	111
ALT-GPT (U/L)	5-18	24.80	5.60	0.23	16	37
AST-GOT (U/L)	60-125	102.27	35.20	0.34	58	190
Cholesterol (mg/dL)	163-397	201.73	55.77	0.28	99	292
Gamma-GT (U/L)	6-17.4	34.20	18.66	0.55	13	83
Total protein (g/L)	59-81	71.67	6.79	0.09	60	82
Triglycerides (mg/dL)	10-19	6.94	3.40	0.49	0.1	12
Urea (mg/dL)	10-25	35.80	6.61	0.18	21	48

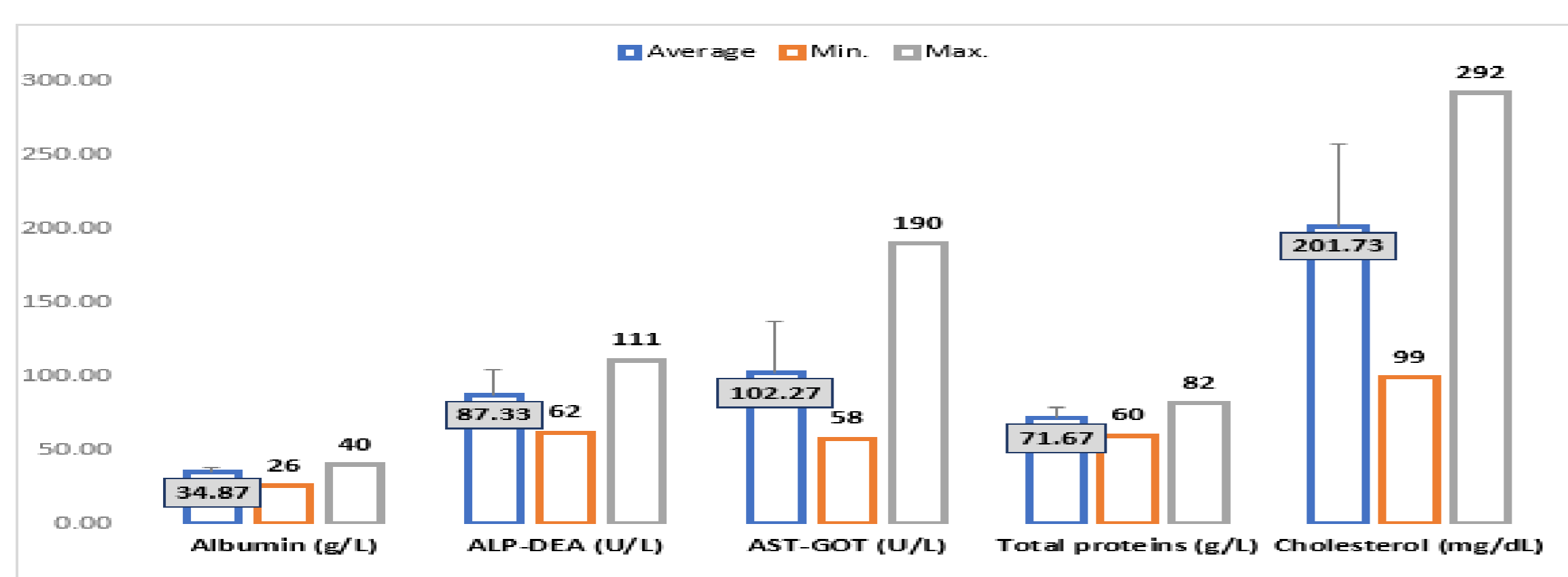


Figure 3. The dynamics of the values of the blood parameters according to the standard

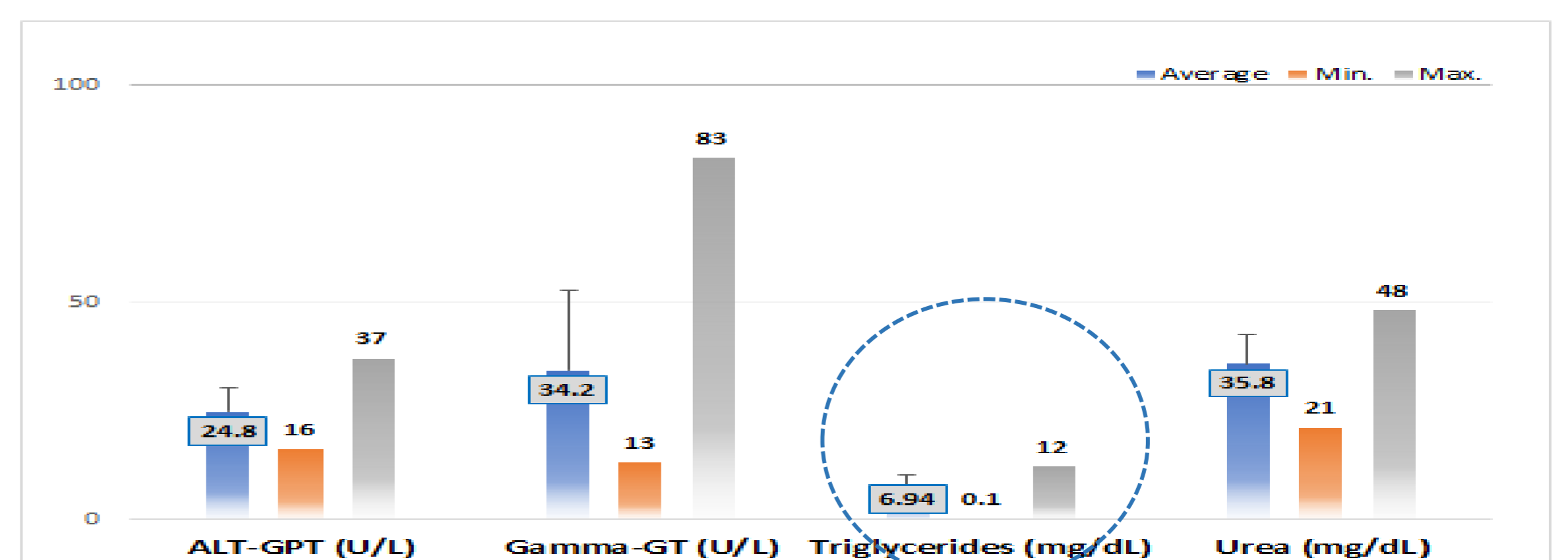


Figure 4. Dynamics of non-standard blood parameter values

		Milk production	Albumin (g/L)	ALP-DEA (U/L)	ALT-GPT (U/L)	AST-GOT (U/L)	Cholesterol (mg/dL)	Gamma-GT (U/L)	Total protein (g/L)	Triglycerides (mg/dL)	Urea (mg/dL)
Milk production (L)	Pearson Correlation	1	.002	-.419**	-.178	.290**	.194	.214*	-.214*	-.665**	.740**
	Sig. (2-tailed)		.985	.000	.094	.006	.067	.043	.043	.000	.000
	N		15	15	15	15	15	15	15	15	15

At the same time, the obtained milk production was correlated with the biochemical parameters of bovine serum, thus there were distinctly significant positive correlations between milk production and aspartate aminotransferase (AST), respectively urea, and an insignificant correlation was between milk production and albumin and cholesterol.

Conclusions

During the experimental period, the average values of the blood biochemical parameters analyzed that did not fall within the limits provided by the specialized literature and that showed a significant increase were: alanine aminotransferase (ALT/ALT) - 24.80 U/L, 6.8 percent more than the maximum allowed, glutamyl transpeptidase (gamma-GT) - 34.20 U/L, 16.8 percent more than the maximum allowed and urea - 35.80 mg/dL, 10.8 percent more. The only parameter that did not fall within the limits provided by the specialized literature and that showed a significant decrease was represented by triglycerides. All the cows involved in the study were apparently healthy at the time of sample collection, but the resulting biochemical analyzes may suggest slight liver disorders. A reduced content in triglycerides showed the fact that the animals studied were in a negative energy balance at that time.