



Research Paper

**CHANGES IN LIVER ENZYMES DIAGNOSTIC PARAMETERS OF SUDAN
NUBIAN GOAT'S KIDS FED DIFFERENT LEVELS OF NATRON AND
MINERALS BLOCK**

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Abstract

This study was carried out to determine changes in liver enzymes diagnostic parameters of male Nubian goat's kids male fed diet supplemented with Natron salts and Minerals block levels at rate of (0-2%), where a total of 40 Nubian goat's kids male (5-7 month old) were used. They were divided into four equal groups and each randomly allocated to diet animal block containing different levels of Natron and Mineral block (0%, 1%, 2%; and 1%, respectively). The experimental period covered twelve weeks. Blood samples were collected every two weeks for chemical analysis, they were taken three times, before feeding in the morning (08.00-09.00), after feeding at midday (01.00-02.00) and in the evening (06.00-07.00). the results indicated that in the evening (06.00-07.00) 8hr after feeding the aminotransferases (GOT, GPT and ALP) values did not show any significant difference between treatment groups (including Control). However, the Glutamate oxaloacetate transaminase (GOT) values in all levels of diet were higher before feeding and decrease significantly after feeding. While Alkaline phosphatase (ALP) values in Mineral block 1% and Natron1% were decrease significantly after feeding. The significant ($P<0.05$) decrease in the Glutamate oxaloacetate transaminase (GOT) values for Control, Natron1%, Natron2% and Mineral block 1% observed at midday followed by the evening which were lower than those in the morning.

Key words: Natron salt, Minerals block supplementation, Nubian goat's kids, liver enzymes parameters.

INTRODUCTION

The liver is a large, complex organ that is well designed for its central role in carbohydrate, protein and fat metabolism. It is the site where waste products of

metabolism are detoxified through processes such as amino acid deamination, which produces urea [1]. Aspartate amino transferases (AST), glutamyl transferase (GGT), alkaline phosphatase (ALP), and alanine amino transferase (ALT), which are enzymes that are mostly produced by the liver [2], are also predictive of the health status of goats [3,4,5,6].

Alterations in liver enzyme levels are one of the most common problems encountered in everyday clinical practice. Finding the way through the multiple diagnostic pathways can challenge even the experienced clinician. Knowledge of the pathophysiology of liver enzymes is an essential guide to understanding their alteration. The pattern of enzyme abnormality, interpreted in the context of the patient's characteristics, can aid in directing the subsequent diagnostic work-up. Awareness of the prevalence of determined liver disease in specific populations and of possible hepatic involvement during systemic illnesses or drug therapies may help the clinician identify the cause of alterations efficiently [7].

The measurement of serum enzymes is an important tool for disease diagnosis in veterinary and human clinical practice. The routinely used enzymes to evaluate hepatic damage in animals includes ALT, AST, ALP, GGT, Sorbitol dehydrogenase (SDH), Lactate dehydrogenase (LDH), Ornithine carbamoyltransferase (OCT) and 5' Nucleotidase (NTP) [8]. In addition, Natron and multi-mineral block are used as a prophylactic agent and a feed supplement to goats. The objective of this study is to evaluate the effect of different levels of Natron salts and mineral block supplementation in goat's diet on liver enzymes diagnostic parameters as a health indicator in goats

MATERIAL AND METHODS

Experimental Site: The present Experiment was carried out under the semi-arid condition of White Nile State-Sudan, at the Faculty of Science, University of Bakht Alruda, in Edduiem locality (Latitudes 130 and 290 North, Longitudes 200 and 320 East) 200 km from Khartoum.

Experimental Animals: Forty male of Sudan Nubian Kids goats at age of 5 -7 months, their average body weight was from (6.5 to 12.5kg) were used in this study. The animals were purchased from local small market in Edduiem city locality they bear the typical characteristic of the indigenous Nubian breed, head convex with pronounced running nose and long pendulous ears. Black being the dominant color with gray ears, light marbling found in some animals. Mature animals body weight ranged from 18- 35kg and body size 70-75cm at wither height. The animals were housed in shaded goat's pen; for 14 days on adapt in period. They were vaccinated with Ivermectin against endoparasite Ectoparasite 0.2ml per/kg body weight; with drawal period. The animals were divided randomly into four groups each of ten animals according to their live weight. First groups with average weight 9.70 kg; used as control (zero Natron salt fed). The second group was 10.10 kg, the third group 10.01 kg and the fourth group 10.58 kg they fed different levels of Natron and Mineral block (0%, 1% Natron, 2% Natron; and 1% Mineral block, respectively). The period of this study was eleven or twelve -weeks.

Experimental procedure

Feedlot performance

Body weight: The animals were weighed firstly and weekly until the end of the ten weeks, and weighed at the end of the experiment. The animals were weighed individually by the pan balance.

Feed Intake and water Intake: Feed and water were offered approximately at the same time in the morning (08.00-09.00) hr. The food offered was weighed in a single pan balance - to the nearest 100g. The food and water was offered in the fodder basins and the remaining amounts from the previous day were measured, so that the amounts of food and water consumed were determined.

Blood collection and analyses

The blood samples needed for testing were taken every two weeks from the jugular vein of the experimental animals three times before feeding in the morning (08.00-09.00) and after feeding at midday (01.00-02.00) and in the evening (06.00-07.00). Samples were taken in plain tube, coagulated at room temperature for 2hours, centrifuged for 10 minutes at 3000 rpm and stored at +4 0C. Serum samples were analyzed for liver enzymes. Liver enzymes Glutamic OxaloaceticTransaminase (GOT), Glutamic Pyruvic Transaminase (GPT) and Alkaline Phosphatase (ALP) were determined according to the method described by [9].

Statistical analysis

The data obtained from the blood samples collected from the Nubian goats fed different levels of Natron and Mineral block (0%, 1%, 2%; and 1%), had been subjected to standard methods of statistical analysis was performed using windows based SPSS (Version 16.0, 2007). The analysis of variance (ANOVA) test was used and Statistical significance was considered when $P < 0.05$.

RESULTS

Table (1): Overall Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation in the morning at 0hr.

Parameter	Control (0%)	Natron (1%)	Natron (2%)	Mineral Block (1%)
GOT(IU/L)	19.26±2.11	17.70±2.07	18.56±1.99	21.03±2.65
GPT(IU/L)	6.16±0.65	4.33±0.46	6.73±1.58	4.90±0.43
ALP(IU/L)	53.56±6.03 ^a	48.06±3.75 ^a	65.03±9.41 ^b	74.83±9.12 ^b

^{a,b,c} means in the same row with different superscripts are significantly different from each other ($P < 0.05$).

Table (1): Show Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation in the morning (08.00-09.00) 0hr before feeding. The values of Glutamate oxaloacetate transaminase (GOT) and

Glutamate pyruvate transaminase (GPT) were on significant ($P>0.05$) in control and treatment groups. While values of Alkaline phosphatase (ALP) were significantly higher ($P>0.05$) in Natron 2% and Minerals block 1%.

The Glutamate oxaloacetate transaminase (GOT) : Control had Glutamate oxaloacetate transaminase (GOT) ranged from 8.23-20.01 IU/L with a mean value of 19.26 ± 2.11 IU/L, Natron 1% had Glutamate oxaloacetate transaminase (GOT) ranged from 6.20-18.40 IU/L with a mean value of 17.70 ± 2.07 IU/L, Natron 2% had Glutamate oxaloacetate transaminase (GOT) ranged from 8.34-18.82 IU/L with a mean value of 18.56 ± 1.99 IU/L and Mineral block 1% had Glutamate oxaloacetate transaminase (GOT) ranged from 7.28-22.20 IU/L with a mean value of 21.03 ± 2.65 IU/L.

The Glutamate pyruvate transaminase (GPT): Control had Glutamate pyruvate transaminase (GPT) ranged from 4.05-9.06 IU/L with a mean value of 6.16 ± 0.65 IU/L, Natron 1% had Glutamate pyruvate transaminase (GPT) ranged from 2.20-7.01 IU/L with a mean value of 4.33 ± 0.46 IU/L, Natron 2% had Glutamate pyruvate transaminase (GPT) ranged from 3.05-7.20 IU/L with a mean value of 6.73 ± 1.58 IU/L and Mineral block 1% had Glutamate pyruvate transaminase (GPT) ranged from 2.81-10.04 IU/L with a mean value of 4.90 ± 0.43 IU/L.

The Alkaline phosphatase (ALP): Control had Alkaline phosphatase (ALP) ranged from 19.49-56.28 IU/L with a mean value of 53.56 ± 6.03 IU/L, Natron 1% had Alkaline phosphatase (ALP) ranged from 26.54-70.04 IU/L with a mean value of 48.06 ± 3.75 IU/L, Natron 2% had Alkaline phosphatase (ALP) ranged from 22.50-145.08 IU/L with a mean value of 65.03 ± 9.41 IU/L and Mineral block 1% had Alkaline phosphatase (ALP) ranged from 56.24-90.14 IU/L with a mean value of 74.83 ± 9.12 IU/L.

Table (2): Overall Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation at midday after 4hrs.

parameter	Control (0%)	Natron (1%)	Natron (2%)	Mineral Block (1%)
GOT(IU/L)	16.76 ± 2.30	14.40 ± 1.52	13.63 ± 1.35	13.36 ± 1.46
GPT(IU/L)	9.10 ± 1.85	8.70 ± 2.06	7.26 ± 1.83	6.70 ± 1.82
ALP(IU/L)	63.76 ± 9.41^a	42.60 ± 3.53^b	56.23 ± 9.36^a	71.10 ± 10.38^c

^{a,b,c} means in the same row with different superscripts are significantly different from each other ($P<0.05$).

The data in Table (2): shows Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation at midday (01.00-02.00) 4hr after feeding. The data indicated that the most Blood Enzymes parameters of goat's kids showed no variation in control and treatment groups except Alkaline

phosphatase (ALP). The data indicated that the value of Alkaline phosphatase (ALP) was higher in Minerals block 1%.

The Glutamate oxaloacetate transaminase (GOT) : Control had Glutamate oxaloacetate transaminase (GOT) ranged from 14.13-22.11 IU/L with a mean value of 16.76±2.30 IU/L, Natron 1% had Glutamate oxaloacetate transaminase (GOT) ranged from 5.20-18.03 IU/L with a mean value of 14.40±1.52 IU/L , Natron 2% had Glutamate oxaloacetate transaminase (GOT) ranged from 5.34-13.86 IU/L with a mean value of 13.63±1.35 IU/L and Mineral block 1% had Glutamate oxaloacetate transaminase (GOT) ranged from 6.86-18.25 IU/L with a mean value of 13.36±1.46 IU/L.

The Glutamate pyruvate transaminase (GPT): Control had Glutamate pyruvate transaminase (GPT) ranged from 2.25-11.06 IU/L with a mean value of 9.10±1.85 IU/L, Natron 1% had Glutamate pyruvate transaminase (GPT) ranged from 1.60-8.91 IU/L with a mean value of 8.70±2.06 IU/L, Natron 2% had Glutamate pyruvate transaminase (GPT) ranged from 3.25-11.20 IU/L with a mean value of 7.26±1.83 IU/L and Mineral block 1% had Glutamate pyruvate transaminase (GPT) ranged from 2.28-8.24 IU/L with a mean value of 6.70±1.82 IU/L .

The Alkaline phosphatase (ALP): Control had Alkaline phosphatase (ALP) ranged from 19.69-85.28 IU/L with a mean value of 63.76±9.41 IU/L, Natron 1% had Alkaline phosphatase (ALP) ranged from 23.35-53.04 IU/L with a mean value of 42.60±3.53 IU/L, Natron 2% had Alkaline phosphatase (ALP) ranged from 15.50-122.12 IU/L with a mean value of 56.23±9.36 IU/L and Mineral block 1% had Alkaline phosphatase (ALP) ranged from 21.56-64.54 IU/L with a mean value of 71.10±10.38 IU/L.

Table (3): Overall Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation in the evening after 8hrs.

Parameter	Control (0%)	Natron (1%)	Natron (2%)	Mineral Block (1%)
GOT(IU/L)	12.96±2.40	11.36±1.14	11.46±1.32	13.50±1.36
GPT(IU/L)	6.13±0.83	6.30±1.60	6.46±1.56	5.10±0.83
ALP(IU/L)	52.70±6.71	48.73±3.96	60.36±9.20	65.50±7.39

^{a,b,c} means in the same row with different superscripts are significantly different from each other (P<0.05).

Table (3): shows the Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation in the evening (06.00-07.00) 8hr after feeding. The Glutamate oxaloacetate transaminase (GOT), Glutamate pyruvate transaminase (GPT) and Alkaline phosphatase (ALP) showed no variation in all the treatment diets.

The Glutamate oxaloacetate transaminase (GOT) : Control had Glutamate oxaloacetate transaminase (GOT) ranged from 3.15-14.12 IU/L with a mean value of 12.96±2.40 IU/L, Natron 1% had Glutamate oxaloacetate transaminase (GOT) ranged

from 3.20-13.13 IU/L with a mean value of 11.36 ± 1.14 IU/L, Natron 2% had Glutamate oxaloacetate transaminase (GOT) ranged from 8.38-16.18 IU/L with a mean value of 11.46 ± 1.32 IU/L and Mineral block 1% had Glutamate oxaloacetate transaminase (GOT) ranged from 10.86-18.06 IU/L with a mean value of 13.50 ± 1.36 IU/L.

The Glutamate pyruvate transaminase (GPT): Control had Glutamate pyruvate transaminase (GPT) ranged from 5.05-8.34 IU/L with a mean value of 6.13 ± 0.83 IU/L, Natron 1% had Glutamate pyruvate transaminase (GPT) ranged from 2.60-7.21 IU/L with a mean value of 6.30 ± 1.60 IU/L, Natron 2% had Glutamate pyruvate transaminase (GPT) ranged from 2.25-7.20 IU/L with a mean value of 6.46 ± 1.56 IU/L and Mineral block 1% had Glutamate pyruvate transaminase (GPT) ranged from 2.38-7.24 IU/L with a mean value of 5.10 ± 0.83 IU/L.

The Alkaline phosphatase (ALP): Control had Alkaline phosphatase (ALP) ranged from 13.66-71.28 IU/L with a mean value of 52.70 ± 6.71 IU/L, Natron 1% had Alkaline phosphatase (ALP) ranged from 18.43-66.04 IU/L with a mean value of 48.73 ± 3.96 IU/L, Natron 2% had Alkaline phosphatase (ALP) ranged from 15.58-145.12 IU/L with a mean value of 60.36 ± 9.20 IU/L and Mineral block 1% had Alkaline phosphatase (ALP) ranged from 39.05-67.24 IU/L with a mean value of 65.50 ± 7.39 IU/L.

Table (4): Overall Blood Enzymes of goat's kids of Control (0%), Natron (1%), Natron (2%) and Mineral Block (1%), pre and post feeding.

Parameter	treatment	Control(0%)	Natron (1%)	Natron (2%)	Mineral Block (1%)
GOT(IU/L)	Pre. feeding	19.26 ± 2.11^A	17.70 ± 2.07^A	18.56 ± 1.99^A	21.03 ± 2.65^A
	Post. feeding	14.86 ± 2.21^B	12.88 ± 1.90^B	12.55 ± 1.25^B	13.43 ± 1.30^B
	Overall	16.05 ± 2.30^a	16.01 ± 1.78^a	14.98 ± 2.01^a	18.02 ± 1.55^b
GPT(IU/L)	Pre. feeding	6.16 ± 0.65	4.33 ± 0.46^A	6.73 ± 1.58	4.90 ± 0.43^A
	Post. feeding	7.62 ± 0.02	7.50 ± 1.50^B	6.86 ± 1.61	5.90 ± 1.06^B
	Overall	5.98 ± 0.67^a	6.15 ± 1.23^a	7.10 ± 1.04^b	4.99 ± 0.45^c
ALP (IU/L)	Pre. feeding	53.56 ± 6.03^A	48.06 ± 3.75	65.03 ± 9.41^A	74.83 ± 9.12^A
	Post. feeding	58.23 ± 6.41^B	45.67 ± 3.65	58.30 ± 7.23^B	68.30 ± 6.15^B
	Overall	56.95 ± 5.33^a	47.56 ± 2.98^b	62.06 ± 4.06^a	72.17 ± 3.56^c

^{A, B} means in the same column with different superscripts are significantly different from each other (P<0.05).

^{a, b, c, d} means in the same row with different superscripts are significantly different from each other (P<0.05).

The results in table (4) shows the Blood Enzymes goat's kids of Control (0%), Natron (1%), Natron (2%) and Mineral Block (1%), pre and post feeding. The results showed variation in Blood Enzymes parameter from 0hr to 8hrs (before and after feeding) in most treatment groups (including control), where in other showed no variation. The Glutamate oxaloacetate transaminase (GOT) decrease significantly ($P<0.05$) 8hrs after feeding in all treatment groups (including control), where increase in overall. Glutamate pyruvate transaminase (GPT) increase in Natron 1%, Mineral Block and overall. Alkaline phosphatase (ALP) increase in control in overall, where decrease in Natron 1% and Mineral Block.

Table (5): Overall Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation after 0hr, 4hrs and 8hrs.

Parameter	morning	midday	evening
GOT(IU/L)			
0%	19.26±2.11 ^a	16.76±2.30 ^b	12.96±2.40 ^b
1%	17.70±2.07 ^a	14.40±1.52 ^b	11.36±1.14 ^b
2%	18.56±1.99 ^a	13.63±1.35 ^b	11.46±1.32 ^b
1%	21.03±2.65 ^a	13.36±1.46 ^b	13.50±1.36 ^b
GPT(IU/L)			
0%	6.16±0.65	9.10±1.85	6.13±0.83
1%	4.33±0.46 ^a	8.70±2.06 ^b	6.30±1.60 ^{ab}
2%	6.73±1.58	7.26±1.83	6.46±1.56
1%	4.90±0.43	6.70±1.82	5.10±0.83
ALP(IU/L)			
0%	53.56±6.03	63.76±9.41	52.70±6.71
1%	48.06±3.75	42.60±3.53	48.73±3.96
2%	65.03±9.41	56.23±9.36	60.36±9.20
1%	74.83±9.12	71.10±10.38	65.50±7.39

^{a,b,c} means in the same row with different superscripts are significantly different from each other ($P<0.05$).

The results in table (5) shows the Blood Enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation after 0hr, 4hrs and 8hrs. The results indicated that some Blood Enzymes parameters Glutamate oxaloacetate transaminase (GOT) showed variation between control and treatment groups during the day, where Glutamate pyruvate transaminase (GPT) Alkaline phosphatase (ALP) for treatment groups (including control) showed no variation during

the day. The values of Glutamate oxaloacetate transaminase (GOT) for treatment groups (including control) increased significantly ($P < 0.05$) during midday and the evening.

DISCUSSION

Table (1): shows the serum blood enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation in the morning (08.00-09.00) 0hr before feeding. No significant variations were recorded in Glutamate oxaloacetate transaminase (GOT) and Glutamate pyruvate transaminase (GPT) in all levels of treatment groups including control. Alkaline phosphatase (ALP) values of 65.03 ± 9.41 and 74.83 ± 9.12 IU/L were similar and significantly higher ($P > 0.05$) in Natron 2% and Minerals block 1% compared to Alkaline phosphatase (ALP) values in control and natron 1%, which were in similar values. Report in West African Dwarf goats (Daramola, et al 2005) [10], showed a GOT, GPT and ALP values of 8.9 ± 0.9 IU/L, 20.9 ± 1.21 IU/L and 10.7 ± 1.20 IU/L respectively. For sheep in the semi-arid environment all the aminotransferases (AST, ALT and ALP) were higher in the ewe lambs than ram lambs (A.A. Njidda et al 2014) [11].

Table (2): shows the serum blood enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation at midday (01.00-02.00) 4hr after feeding. The results show that there were no significant differences in Glutamate oxaloacetate transaminase (GOT) and Glutamate pyruvate transaminase (GPT) for all levels of treatment groups including control. The highest Alkaline phosphatase (ALP) value was recorded for goat's kids on Mineral block followed by Natron 2% and Control which were significantly ($P < 0.01$) higher than the value for goat's kids on Natron 1%. The values of all the aminotransferases (AST, ALT and ALP) in all levels of diet were higher than the findings of Olurotimi A. Olafadehan (2011) [12] for Red Sokoto goats.

Table (3): shows the results of serum blood enzymes for goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation in the evening (06.00-07.00) 8hr after feeding. The aminotransferases (GOT, GPT and ALP) values did not show any significant difference between treatment groups (including Control). These values of liver enzymes (AST, ALT and ALP) in all levels of diet were lower than the findings of Taiwo and Ogunsanmi (1995) [13] for Grey Duiker, and West African Dwarf sheep and goats but were higher than the findings of Olurotimi A. Olafadehan (2011) [12] for Red Sokoto goats.

Table (4) shows overall blood enzymes of goat's kids of Control (0%), Natron (1%), Natron (2%) and Mineral Block (1%), pre and post feeding. The Glutamate oxaloacetate transaminase (GOT) values in all levels of diet were higher before feeding and decrease significantly after feeding. While Alkaline phosphatase (ALP) values in Mineral block 1% and Natron 1% were decrease significantly after feeding. The animals on Mineral block 1% and Natron 1% had Glutamate pyruvate transaminase (GPT) values (5.90 ± 1.06 and 7.50 ± 1.50 IU/L) after feeding which were significantly ($P < 0.01$) higher than those before feeding. In the study of Olurotimi A. Olafadehan (2011) [12] for Red Sokoto we observed that The aminotransferases (GOT,

GPT and ALP) values of goats fed Pterocapus erinaceus diet of 25%, 50%, 75% and 100% were similar. According to Mbassa, G.K., Poulsen, J.S (1991) [14] the activity of such enzymes as ALT, AST, and γ -GT, used as indicators of physical stress, were higher in group C than the youngest goats. Alanine aminotransferase was stable only up to 8 days at 4 °C whereas marked stability was noticed at -20 °C and room temperature as long as 14 days. Aspartate aminotransferase was more stable at -20 °C up to 14 days and 11 days at 4 °C whereas at room temperature only 2 days. Alkaline phosphatase showed great variation upon storage as compared to other hepatobiliary enzymes and it is suggested that its estimation should be performed in fresh serum sample to get a more accurate result [15].

Table (5) shows the serum blood enzymes of goat's kids as affected by fed different levels of Natron salts and Minerals block supplementation after 0hr, 4hrs and 8hrs (in the morning, at midday and in the evening). The results indicated that the Glutamate oxaloacetate transaminase (GOT) values of control and treatment groups showed variation during the day, where Glutamate pyruvate transaminase (GPT) and Alkaline phosphatase (ALP) showed no variation during the day. The significant ($P < 0.05$) decrease in the Glutamate oxaloacetate transaminase (GOT) values for Control, Natron1%, Natron2% and Mineral block 1% observed at midday followed by the evening which were lower than those in the morning. According to Mohammed A. et al (2010) [16], the aminotransferases (GOT, GPT and ALP) values did not show any significant difference from 4weeks up to 20weeks. In this study the aminotransferases (GOT, GPT and ALP) values for all levels of diet from the morning up to the evening were not in agreement with the report of KAMALU et al., (1988) [17] and Mohammed A. et al (2010) [16]. According to Zilva, J.F and Panall, P.R. (1984) [18] normal plasma levels reflect the balance between the synthesis and release of enzymes during physiological cell turnover and their clearance from the circulation. Report in Nguni goats of South Africa (Rumosa Gwaze et al 2012) [19] show higher AST, ALP, and ALT concentrations in the wet compared to the dry season ($P < 0.05$).

CONCLUSION

From the results of the present study, it can be concluded that supplementation of small ruminant's diet with level of natron salts 2% and mineral block 1% during breeding time of animals for better goat's kids production performance. Levels of natron salts 2% and mineral block 1% as supplementation showed no effect in the aminotransferases (GOT, GPT and ALP) in blood plasma. More researches are needed to show the best level of natron and mineral block as supplementation for better goat's liver enzymes

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