



Dynamics of Enzymatic Activity of Aspartate Aminotransferase in Liver Tissues of Goats, Depending on the Degree of Parasite Infestation

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Abstract

The article presents data of experimental studies of aspartate aminotransferase activity of liver enzymes of goats in Khizi - Khachmaz zone of Azerbaijan in different seasons of the year. The enzymatic activity was determined spectrophotometrically on a Specol 1500 spectrophotometer (Analytik Jena) at a wavelength of $\lambda=540$ nm. The maximum average increase in aspartate aminotransferase activity of liver enzymes of invasive goats in spring was 2.66 times, in summer, autumn and winter periods in 2.03, 1.47 and 1.37 times, in comparison with the liver tissues of practically healthy animals. The maximum value of aspartate aminotransferase activity of liver enzymes of goats invaded by nematodes was noted in spring and summer, and minimal in autumn and winter, reaching values of: 102.5 ± 6.5 ; 78.3 ± 4.3 and 56.5 ± 2.3 ; 52.8 ± 1.3 U/L, respectively.

Keywords: Aspartate-aminotransaminase; Goats; Liver tissues; Trematodes; Enzyme activity.

1. Introduction

Factors contributing to the emergence of diseases are unfavorable conditions of keeping and feeding animals, leading to a decrease in the resistance of the body and metabolic disorders. Any pathological process to a certain extent leads to a change in metabolism in the body of animals in general. In turn, a general disturbance of homeostasis can lead to a disruption in the metabolism of the liver and the occurrence of various pathologies of the organ [1].

Many leading scientists of the world suggest the possibility of a correlation between the productivity of animals and the activity of enzymatic systems. However, the available experimental data on this problem, unfortunately, are now disjointed, fragmentary and often contradictory. Animals are for a long time in pastures under the influence of changing environmental conditions, which certainly affects the animal organism, the level of metabolism in general and, ultimately, the resistance of the organism [2, 3]

Especially the determination of the activity of aminotransferases for the diagnosis of liver diseases is important. Diseases of the liver, leading to a decrease in productivity and the impossibility of further exploitation of animals, are recorded everywhere. Dystrophies of the liver of various etiologies occupy one of the first places among them.

The ubiquitous spread of liver diseases among goats of different ages, the difficulties of their diagnosis, treatment induce to conduct new researches at the modern level.

The determination of the activity of aminotransferases for the diagnosis of liver diseases is especially important. Decrease in aspartate aminotransferase is typical for hepatic cell necrosis in viral hepatitis (up to 0.6-0.8). At acute infectious hepatitis, ALT is increased more than AST. At cirrhosis of the liver, AST is increased more than ALT. At myocardial infarction, a greater increase in AST activity than ALT is characteristic, therefore de Ritis's coefficient increases.

The deviations obtained characterize the impairment of the functional activity of the liver. Damage to the parenchymal elements of the liver leads, as a rule, to a decrease in the protein-synthetic function of the liver, which is accompanied by a decrease, first of all, in the level of albumins. Such changes can serve as indicators of morphofunctional changes in the body of sheep and the development of hepatological syndrome.

The determination of enzyme activity is currently used to diagnose diseases of various etiologies. Being proteins localized inside cells, they are normal in serum and blood plasma have low activity or it is generally absent [4-6].

The authors found that faecal egg counts were significantly higher in the wet compared with the dry season. Most ($P<0.05$) of the goats were within the reference values for calcium, phosphorus, and magnesium in both seasons. Phosphorus concentrations were significantly affected by age with higher levels in the young (2.1 ± 0.06) compared to the adult (2.0 ± 0.03) goats. Alkaline phosphatase was significantly affected by age with higher levels in young than in mature goats. Higher AST, CK, and GGT concentrations were recorded in the wet compared to the dry season ($P<0.05$).

The plain test tubes containing blood were centrifuged at 1000 g for 10 min to obtain serum, which was stored at -20°C prior to analysis. Serum was analyzed using commercially available kits (Siemens, Midrand, South Africa) and a Chexcks machine (Next/Vetex Alfa Wasseman Analyser, Woerden, the Netherlands). Inorganic phosphorus, calcium, and magnesium were determined by the use of colorimetric methods. Alkaline phosphatase activity, alanine transaminase, and gamma-glutamyltrans-ferase levels in the blood serum were analyzed spectrophotometrically according to the method by Bürger, *et al.* [7]. Ultraviolet methods were used for determinations of creatine kinase

(CK) and aspartate aminotransferase (AST) [8]. Aspartate aminotransferase in Wet season below (97.6 (40), within 2.4 (1); in Dry season below 98.2 (54), within 1.82 91) [7-9].

It is noted that the increase in the physiological activity of parasites occurs in the spring and summer and in a lesser degree in the autumn [10].

Clinico-histopathological studies on the correlation between some parasitic infestation on liver and ovarian efficiency in Small Ruminants were held.

Seventy-five liver samples of (55 adult sheep and 20 adult goats) were collected from abattoirs at Giza governorate Egypt during the period from September 2011-May 2012. Liver samples were visually examined for some parasitic infestation as well as pathological changes. From each animal, liver, heart muscle, ovary, uterus and serum samples were taken. 26.7% of them showed parasitic infestation.

Histopathologically, liver tissues with fascioliasis showed 2.6 % acute hepatitis, 9% chronic catarrhal cholangio-hepatitis with hyperplastic biliary epithelium including granuloma formation in 4 % of them. While liver Sections infested with *C. tenuicollis* revealed presence of 2.6% acute hepatitis with cyst formation, 8% chronic cholangio-hepatitis. Out of 21(26.7%) parasitically infested animals, 17(22.6%).

At parasitized animals ,higher values ($P<0.05$) for AST, ALP, GGT and ALT activity as well as cholesterol when compared to control non infested animals were revealed. In serum glucose level and total proteins showed a significant decrease. The present study concluded that a tight relationship is existed between hepatic and ovarian efficiency. Also the parasitic infestations in small ruminants. *C. tenuicollis* may be affected on the animals fertility as fascioliasis as its damage effect on liver [11].

Reproductive disorders and parasitic infestation are tissue end by liver cirrhosis [12]. Cestodes of the family the main problems that affecting productivity and cause Taeniidae that infect the dog (definitive host) and great economic losses in farm animals [13, 14]. Parasitic liver transmitting to a range of intermediate host species where affections in meat-producing animals are one of major they cause cysticercosis. *Cysticercus tenuicollis* is the larval stage of the canine tape worm economic losses, either directly through condemnation of *Tania hydatigena*. The cysticercoids are developed as the pathologically affected livers, or indirectly by their fluid-filled cysts and commonly found attached to the effect on the animal growth and so its meat production, omentum, mesentery, liver and peritoneum. Massive [15, 16]. From those parasitic liver affections, fascioliasis and invasion and migration of the cysticercoids through the cysticercosis which recently have been shown to be with liver tissue and encysts on the peritoneal membranes of widespread zoonosis throughout the world [17, 18]. ruminants, results in acute severe traumatic hepatitis with Fascioliasis is an important helminthes disease caused hemorrhagic and fibrotic tracts known as hepatitis by two trematodes, *Fasciola hepatica* [19].

The changes occurring in helminthiasis in organs and tissues serve as an indicator of metabolic disturbances, the presence of dystrophic processes, allergic and immunomorphological reactions, that means, they are the response of the organism to the pathogenic action of the helminth.

Currently, the primary control strategy for nematode infections is the use of chemical treatments [20]. Three classes of modern synthetic anthelmintics are known, each having a different mode of action but the control strategies are still insufficient because of the potential resistance to the drugs.

Thus, alternative methods for control of gastrointestinal nematodes need to be developed. Knowledge of the seasonal population trends, nematode life cycle and the prevalence of larvae in sheep and goats is necessary for the developing of control programs.

Proceeding from the foregoing, the aim of these studies was to study the dynamics of aspartate-transaminase enzymatic activity of nematodes in biomaterial taken from the liver of slaughtered goats of Khizi-Khachmaz zone of Azerbaijan in different seasons of the year.

2. Material and Methods of Research

The object of the study were goats (infected and uninfected) from various regions of Azerbaijan (Khizi and Khachmaz). The material for the study was the liver of 95 goats slaughtered in the winter, spring, summer and autumn periods of the year.

The determination of the aspartate transaminase activity of liver enzymes was performed spectrophotometrically on a Specol 1500 (Analytik Jena) spectrophotometer according to the Reitman method proposed by Kolb VG, Kamyshnikov VS and Osadchaya L.M. In order to determine the transaminase activity, 1 gram of liver tissue was homogenized in a glass homogenizer in a 9-fold volume of 0.25 M sucrose, and the homogenizer was placed in an ice vessel. The homogenate was centrifuged for 15 minutes at 15,000 rpm. The supernatant was diluted with sucrose in a ratio of 1:50. Then 0.5 ml of the substrate solution was added to the tube, 0.1 ml of homogenate was added and the tube was placed in a thermostat at 37 ° C for 1 hour. 0.5 ml of dinitrophenylhydrazine was added and the samples were allowed to stand for 20 minutes at room temperature. Then, 5 ml of 0.4N NaOH was added and left at room temperature for 10 minutes to develop color. The optical density was measured on a spectrophotometer at a wavelength of $\lambda=540$ nm. Against the control sample, which contained all the ingredients of the test sample, with the exception of the homogenate, 0.1ml of distilled water was taken instead of the homogenate.

3. The Results of the Study and Discussion

In goats, after the decapitation, the liver was removed, thoroughly crushed with subsequent and homogenizing with a 9-fold volume of 0.25 M sucrose, at room temperature The homogenizer was placed in an ice vessel.

Aspartate-transaminase activity was determined according to the Reitman method proposed by Kolb VG. with co-authors.

The optical density of the samples was measured on a Specol 1500 spectrophotometer (Analytik Jena) at a wavelength of $\lambda=540$ nm.

In the study of aspartate transaminase activity of enzymes in liver tissue homogenates of both healthy and invasive goats, an increase in activity indicators was revealed in all experimental groups of samples compared to control samples. This indicated the presence of aspartate-transaminase activity in the investigated homogenates.

Quantitative data on the determination of aspartate-transaminase activity of hepatic liver enzymes in winter, spring, summer and autumn seasons are given in [table 1](#).

As studies shows, the value of aspartate transaminase activity in liver tissues of invasive animals is higher than in liver tissues of practically healthy animals, and ranges from 36.1 ± 1.4 to 40.8 ± 2.1 U / L for practically healthy animals and from 50.5 ± 2.4 to 102.5 ± 6.5 U / L for parasites invaded by parasites, respectively.

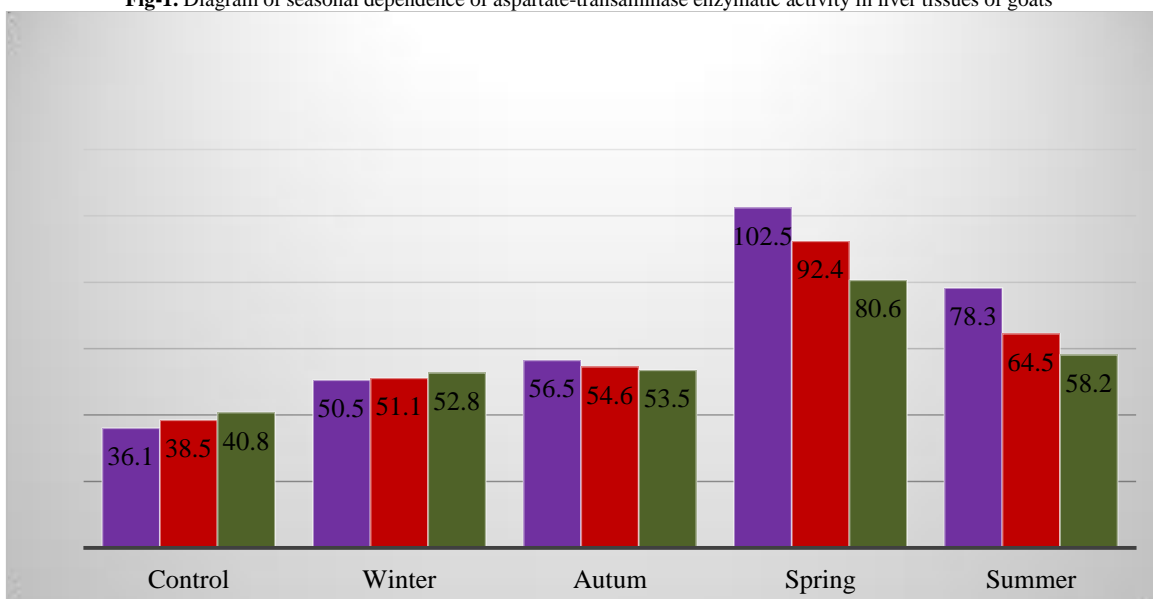
In the infected animals, the percentage of the liver increased by 0.03-0.77%. That means, there is an increase in the organ, which is a consequence of inflammatory processes and intoxication of the animal's body and is accompanied by hyperfunction and compensatory increase in the size of organs.

Table-1. Dynamics of determination of aspartate-transaminase enzymatic activity of liver tissues of goats depending on the degree of infection with parasites

Aspartate-transaminase activity , U/L								
Months								
control	Winter season (experience)		Spring season (experience)		Summer season (experience)		Autumn season (experience)	
36.1±1.4	December	50.5±2.4	September	56.5±2.3	March	102.5±6.5	June	78.3±4.3
38.5±1.3	January	51.1±1.8	October	54.6±2.1	April	92.4± 3.1	July	64.5±3.2
40.8±2.1	February	52.8±1.3	November	53.5±3.2	May	80.6±2.5	August	58.2±2.1

[Figure 1](#) shows the data on the determination of aspartate-transaminase activity in the liver tissues of goats, in different seasons of the year, related to the state of animal health.

Fig-1. Diagram of seasonal dependence of aspartate-transaminase enzymatic activity in liver tissues of goats



As can be seen from the figure, the aspartate-transaminase activity in liver tissues of goats is maximally increased by 2.66 times, in comparison with the values of enzyme activity determined by us in liver tissues of invasive goats during the spring period of time. The minimum increase (1.31 times) of the enzyme activity, was noted in December. In winter, in February, the enzyme activity increased by 1.37 times.

Thus, comparing the average values of aspartate-transaminase activity of liver enzymes of goat liver taken from invasive and non-invasive animals in different seasons of the year, it should be noted that their difference is significant ($P>0.98$). In conclusion, it should be noted that aspartate-transaminase enzymatic activity in goat liver tissues reaches a maximum value in the spring season and is characterized by the highest values in March (102.5 ± 6.5 U/L), and the lowest in December (50.5 ± 2.4 U/L).

From the results of experimental studies it follows that the transaminase activity of liver enzymes of goats is significantly influenced both by the season of the year and by the general physiological state of the animals.

Thus, it can be stated that the activity of aspartate aminotransferase (ACAT) reflects the functional state of the liver of animals. The activity of transaminases increases as a result of destructive processes in the liver and the disturbance of protein metabolism in the body of animals infected with parasites.

4. Conclusions

As a result of the studies, the presence of goat aspartate-transaminase activity of enzymes in the test liver samples was found, reaching maximum volume in the spring season ($102.5 \pm 6.5U/L$), and minimal ($50.5 \pm 2.4U/L$) in the winter season

The maximum average increase in spring was found to be 2.66 times, and in the summer, autumn and winter periods, insignificant increases in enzyme activity indices (in 2.03, 1.47 and 1.37 times) were revealed, in comparison with the liver tissues of practically healthy animals.

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