

Seasonal Changes in the Enzymatic Activity of Aspartate Transaminase in Liver Tissues of Goats Infested by Parasites

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ABSTRACT

The article presents experimental studies of the detection of aspartate transaminase activity in the hepatic tissues of goats of Khizi-Khachmaz zone of Azerbaijan in different seasons of the year for the period from December 2017 to January 2018, depending on the degree of invasion by parasites of animals.

Determination of the enzymatic activity was carried out spectrophotometrically using a Folin reagent on a Specol 1500 spectrophotometer (Analitik Jena).

The maximum peak of intensity of aspartate-transaminase enzymatic activity of liver tissues of goats was revealed. The maximum value of the enzyme activity helminthes in liver tissues was reached in Spring season in March equal to 191.1 U/l of tyrosine per gram of tissue weight of the liver, and the minimum was in December reaching 72.1 U/l of tyrosine per gram of wet weight of the hepatic tissue.

Thus, experimental studies were conducted to identify aspartate-transaminase activity of hepatic tissue in goats infested by parasites in different seasons of year. Proceeding from the obtained data, it can be stated that the season of the year and the climatic conditions of their maintenance in farms significantly influences the aspartate-transaminase enzymatic activity of goat homogenates.

Thus, comparing the average values of aspartate-transaminase activity in homogenates of non-modal tissues isolated from goat liver in different seasons of the year, it should be noted that their difference is significant ($P > 0.96$).

The maximal intensity peak of aspartate-transaminase activity in liver tissues of goats infested by parasites was found in winter (186.4 μg) and spring (168.6 μg) periods of the year and the minimum was found in summer season equal to 72.1 μg of tyrosine per gram of wet weight of helminth.

Keywords: Enzyme activity, Aspartate transaminase, Goats, Parasites

INTRODUCTION

The biology of pathogens of helminthes transmitted to humans through meat and meat products, in conjunction with the climatic and socio-economic characteristics of various administrative ethnic regions of the country, determine the peculiarity of the epidemiology and epizootology of these invasions in each specific area and zoogeographical zone. The fight against these biohelminthiasis is based on a comprehensively differentiated approach to each nosoform; it requires a differentiated, integrated, dynamic and flexible approach to the problems under consideration, the successful solution of which depends on the timeliness and regularity of the activities. Nematodes are pathogenic parasites causing disease in the host. They usually live in the host's digestive system. It causes weight loss in sheep and goats, feeding on the blood of the host and also causes anemia [1].

Proteolytic enzymes play an important role in the study of nutrition of some nematodes and mainly in the study of the nutrition of tapeworms [2].

One of the important factors determining the extent of spread and intensity of invasions is the time of year and the climatic conditions in the farms [3].

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It is noted that the increase in the physiological activity of parasites occurs in spring, in summer and to a lesser extent in autumn. All this is due to the biological cycle of helminthes in the host and in the environment, the nature of animal nutrition, phenomena of latent invasion and an increase or suppression of the sexual activity of helminthes in the host organism [4].

In addition, insufficient veterinary care contributes to the development and transmission of nematodes. This problem is especially evident in small ruminants, sheep and goats. Consequences of nematode invasion include: reduced feed intake, reduced immunity, reduced fertility, reduced milk production, treatment costs and death in critical infections [5].

At trematodoses in varying degrees, a decrease in the quality and nutritional value of meat is recorded, especially in protein, which is accompanied by a decrease in calories by 6.7-21.9% [6,7].

Parasites can have a twofold effect on the host [8]. On the one hand, they stimulate the immune response, resulting in a number of cellular and humoral response phenomena and on the other hand, they cause inhibition of the functional and proliferative activity of lymphoid tissue cells, leading to the development of secondary immune deficiencies. This contributes to a dramatic change in the nature of the relationship in the host-parasite system and helps the survival of the latter in the host organism [9,10].

The aim of our research was to study the dynamics of aspartate transaminase enzymatic activity of goat liver tissues taken from slaughtered goats of the Khiza - Khachmaz zone of Azerbaijan in different seasons of the year.

MATERIALS AND RESEARCH METHODS

The object of the study was goats (infected and uninfected) from the regions of Azerbaijan (Khizi and Khachmaz) for the period from December 2017 to December 2018 inclusive. Totally 65 goats were investigated. For the experiments, 8-9 month old animals were taken.

The material for the study was the liver of goats (65), cut in winter (December, January, February), spring (March, April,

May), summer (June, July, August) and autumn (September, October, November) periods of the year.

Experimental studies to determine the enzymatic activity were performed spectrophotometrically using Folin's reagent on a Specol 1500 spectrophotometer (Analytik Jena).

Per unit of enzymatic activity, the amount of enzyme catalyzing in 30 minutes hydrolysis of 1 g of protein not precipitated with trichloroacetic acid was taken. In this case, 1 g was 25% of the protein taken for the enzymatic reaction.

RESEARCH RESULTS AND DISCUSSION

In winter, spring, autumn and summer, helminthes were removed from the liver of slaughtered goats, thoroughly washed with 0.9% sodium chloride solution, then dried with filter paper, followed by grinding and homogenizing with three volumes of 0.025 N HCl at room temperature. In this case, the homogenizer was placed in a vessel with ice. Casein was used as a substrate.

The enzymatic activity of goat liver tissues was determined by the method of Kunitz and Anson modified by Orekhovich [9].

1 ml of the helminthes homogenate was added to a solution of 1 ml of casein. The mixture was incubated for 1 hour in a thermostat at 37°C, then 3 ml of a 5% solution of trichloroacetic acid was added. Samples were left for 1 h to form a precipitate, followed by centrifugation. Next, 1 ml of centrifugate was taken 2 ml of 0.5 M NaOH and 0.9 ml of Folin solution was added. Pre-folin solution was diluted three times with distilled water. The prepared samples were left for 10 min before the development of a stable color.

Measurements of the optical density of the samples were carried out on a Specol 1500 spectrophotometer (Analytik Jena) at a wavelength of 750 nm. Samples in which trichloroacetic acid was added together with the filtrate served as controls. Enzyme activity was expressed in μg of tyrosine in 1 ml. The results were recalculated for 1 g of the wet weight of the worms.

Quantitative data on the determination of enzyme activity in the hepatic tissue of goats infested by parasites was carried out in winter, autumn, spring and summer seasons of the year (**Table 1**).

Table 1. Data on the seasonal dependence of the enzymatic activity of helminthes tissues in goat liver infested by parasites (in µg tyrosine per gram of wet weight of helminthes).

Aspartate transaminase activity, U/l							
Months							
Winter season		Autumn season		Spring season		Summer season	
December	72.1 ± 1.2	September	129.6 ± 1.8	March	191.1 ± 2.5	June	168.6 ± 3.1
January	88.3 ± 0.9	October	136.2 ± 2.1	April	186.4 ± 2.2	July	141.3 ± 2.7
February	82.2 ± 0.7	November	148 ± 2.1	May	159 ± 1.9	August	112 ± 1.9

The maximal intensity peak of aspartate transaminase activity in helminthes in liver tissues of goats invaded by parasites was found in spring (191.1 U/l) and summer (168.6 U/l) periods and the minimum in winter season was 72.1 U/l.

In invasive animals, an increase in aspartate transaminase activity in liver helminthes tissues is observed, reaching a maximum value in the spring, which is a result of intoxication of the animal. However, in December, there was a decrease in activity (72.1 U/l) and in January an increase in enzymatic activity to 88.3 U/l was observed, followed by a decrease in the level of enzymatic activity in February to 82.2 U/l.

Comparing the average values of aspartate-transaminase activity in homogenates of the tissues of the liver of goats, invaded by helminthes, in different seasons of the year, it should be noted that their difference is significant (P>0.96). In conclusion, it should be noted that the maximum peak of enzymatic activity in goat liver tissues reaches in winter season and spring season of the year and is characterized by the highest rates in March and June and the lowest in December, reaching 72.1, 88.3 and 82.2 U/l, respectively.

A different picture is observed in the tissues of the liver of goats infested by parasites (**Figure 1 and Table 2**).

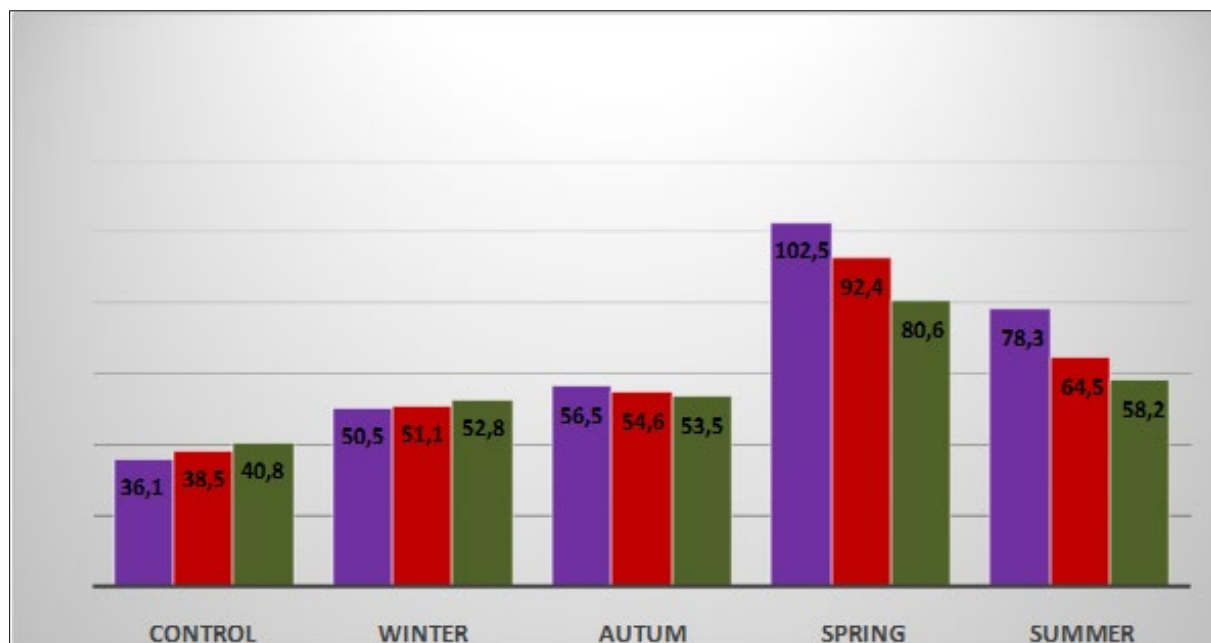


Figure 1. Dynamics of aspartate-transaminase enzymatic activity of liver tissues of goats, depending on the degree of parasite infestation.

Table 2. Aspartate-transaminase activity of liver tissues of goats, depending on the degree of parasite infestation.

Aspartate-transaminase activity, U/L								
Months								
Control	Winter season (experiment)		Spring season (experiment)		Summer season (experiment)		Autumn season (experiment)	
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

Thus, comparing the average values of aspartate transaminase activity in homogenates of non-mode tissues isolated from goat liver in different seasons of the year, it should be noted that their difference is significant (P>0.96). In conclusion, it should be noted that the maximum peak of enzymatic activity in the tissues of goat liver reaches in the spring season and summer season of the year and is characterized by the highest rates in March, and the lowest in December reaching 102.5 U/L and 50.5 U/L, respectively.

FINDINGS

1. Experimental studies were carried out to identify the aspartate transaminase activity of the liver tissue in goats infested by parasites in different seasons of the year. Based on the data obtained, it can be stated that the aspartate transaminase enzymatic activity of goat liver homogenates is significantly influenced by the season of the year and the climatic conditions of their keeping in farms.
2. The maximum peak intensity of aspartate transaminase activity in the tissues of helminthes of goats liver infested by parasites in spring (191 U/L) and summer (168 U/L) periods of the year and the minimum in winter season reaching 72 U/L in December.
3. The maximum peak intensity of aspartate transaminase activity in the tissues of goat liver infested with parasites was found in the spring (102.5 U/L) and summer (78.3 U/L) periods of the year, and the minimum in the winter season reaching 50.5 U/L in December.

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