Post Helminthes infection changes in AAT and AIAT activity in the myotomal muscles of *Channa punctatus*

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ABSTRACT

In the post helminth infection, Aspartate aminotransferase (AAT) and Alanine aminotransferase (AlAT) activity changes have been studied in the Myotomal muscles of *Channa punctatus* due to the intestinal infection by *Genarchopsis goppo* Ozaki (1925) and liver infection by *Callodistomum diaphanum* Odhner (1902). The biochemical parameters that have been investigated are AAT and AlAT. These parameters were showed an increase in the myotomal muscles of infected animals. The increase of substrate content enzyme and the activity levels of enzymes suggest that in the myotomal muscles the rate of AAT and AlAT activity is greatly enhanced during the liver infection than to the intestinal infection. This indicates that liver plays an active role in metabolic changes that occurred due to helminth infestation. The increase activity levels of AAT and AlAT indicate that biochemical adaptations of hosts to combat the parasitic effect.

Key words: *Aspartate aminotransferase, Alanine aminotransferase, Channa punctatus, Genarchopsis goppo, Callodistomum diaphanum.*

INTRODUCTION

Aspartate aminotransferase and Alanine aminotransferase are the enzymes that are commonly used in the amino acid metablism and also serve the function of linking carbohydrate and protein metabolism. The first step in the catabolism of most of the L-amino acids is the removal of the α-amino group by a group of enzymes called Aminotransferases (= transaminases). In these reactions, the α-amino group is transferred to the α-carbon atom of $\alpha-$ etoglutarate, leaving behind the corresponding α-keto acid analogue of the amino acid. All Aminotransferases posses a common prosthetic group and have a common reaction mechanism. The prosthatic group is pyridoxal phosphate (PALP) which is the coenzyme form of pyridoxine. Besides acting as a co-factor in the glycogen phosphorylase reaction, PALP also participates in the metabolism of molecules containing aminogroups. PALP functions as an intermediate carrier of amino groups at the active site of Aminotransferases. It undergoes reversible transformations between its aldehyde form which can accept an amino group and its aminated form (pyridoxamine phosphate, PAMP) which can donate its amino group to an a–keto acid.

When proteins are utilized for the release of energy, they are catabolised in different ways. One such of the enzymes transaminases that are responsible for the interconversion of amino acids to keto acids and vice versa. Therefore, a study of important transaminases like Aspartate aminotransferase and Alanine aminotransferase helps in understanding the alterations in the rate of metabolic activities.

The transamination of glutamate is catabolized by Asparatate amino transferase and Alanine aminotransferase present in the liver. The increased glutamate content can be regulated by the action of the enzyme Aspartate transaminase.

Oxaloacetic acid reacts with L-glutamate and produce L-Aspartate and $\alpha-$ketoglutarate. The α –ketoglutarate is incorporated into the Kreb's cycle. These conditions lead to an increase in the glutamate and pyruvate in the host.

The host counteracts this situation by increasing the activity of Alanine amino transferase and Aspartate aminotransferase for the continuous supply of Alanine and α-ketoglutarate required by the parasite. This also indicates the biochemical adaptation of the host to the metabolic needs of the parasites. Such Alterations have been studied by a number of workers like Ansari and Singh (1974), Bhonsle (1980), Bikshapathi. (1992), Georgieva, Kamenov (1983), Keshavan, Kamble, Kuldrani (2005), Kameswari (1978), Patak, Kumar and Gaur (1984), Pumptawar, Ambore (2005), Muralidhar Rao (1991), Mohan Reddy (1985). The study has been made on the activity of Aminotransferases (AAT and AlAT) of myotomal muscles of *Channa punctatus* due to the intestinal infection with *Genarchopsis goppo*, Ozaki (1925) and liver infection by *Callodistomum diaphanum* Odhner (1902). The parameters studied in the present investigation are AAT and AlAT.

MATERIALS AND METHODS

The *Channa punctatus* were collected from the local area, within the radius of 15 km from the vicinity of Kakatiya University Campus. These live animals both infected and uninfected were cut open and the myotomal muscle tissue was collected for the investigation of AAT and AlAT.

The Aspartate aminotransferase activity (L-aspartate 2-oxoglutarate aminotransferase, E.C. 2.6.1.1) was estimated by the method of Reitman and Fraenkal (1957) as modified by the Bergmeyer (1965).

500 mg of tissue was homogenized in 10 ml of sucrose solution and centrifused at 2500 rpm for 15 minutes. The supernatant was used as the source of enzyme. 0.2 ml of supernatant was mixed with 1 ml of 100 μ-moles of phospate buffer pH 7.4, 100 μ-moles of L-aspartic acid and 2 μ-moles of μ-ketoglutaric acid. The contents were incubated for 1 hour at 37^0C. 1 ml of 2, 4-dinitrophenyl hydrazine was added to arrest the reaction and allowed to stand at room temperature for 20 minutes. 10 ml of 0.4 M NaOH was added and the optical density was determined at 540 nm after adjusting the colorimeter to zero with the blank.

The AAT activity is expressed as μ -moles of sodium pyruvate/mg protein/hour. The Alanine aminotransferase activity (DL-Alanine: 2-Oxoglutarate amino transferase E.C. 2.6.1.2) was determined by the method of Reitman and Fraenkal (1957) as modified by Bergmayer (1965).

500 mg of tissue was homogenized in 10 ml cold sucrose solution (0.25 M) and centrifused at 2500 rpm for 15 minutes. The supernatant was used to estimate the enzyme acivity. 0.2 ml of supernatant was added to the reaction mixture to make a total volume of 1 ml containing 100 □ moles of phosphate buffer pH 7.4, 100 μ- moles of Alanine and 2 μ- moles of 1 α-ketoglutaric acid. The contents were incubated at 37^0C for one hour and the reaction was stopped by adding 1 ml of 2,4 dinitrophenyl hydrazine. The tubes were allowed to stand at room temperature for 20 minutes and 10 ml of 0.4 N NaOH was added. The optical density was determined at 540 mm after adjusting the colorimeter to zero with the blank. The AlAT activity is expressed as m moles of sodium pyruvate/mg protein/hour.

RESULTS AND DISCUSSION

The results obtained on the activity level of AAT in *Channa punctatus* due to the liver and intestinal infection shows (Table. 1 and Fig. 1) that the AAT activity in myotomal muscles of uninfected animal is 0.04389 $\pm$ 0.00358 μ-moles of pyruvate/mg of tissue/hour and in infected animal this activity is 0.0665 $\pm$ 0.0407 and 0.05065 $\pm$ 0.0051 μ-moles of pyruvate/mg of tissue/hour during liver and intestinal infections respectively. When the host was carrying liver and intestinal infection, the muscle AAT activity showed an increase by 51% and 8% respectively. The activity of Aspartate aminotransferase increased during liver and intestinal infection of the host. It is due to the increase of the pyruvate and Glycogen content during these infections. This suggests that the increased pyruvate may be converted to Glycogen through gluconeogenesis. The increased Glycogen content is a common feature observed during helminth infections (Kameswari, 1978; Sulochana, 1982; Rama Hanumantha Rao, 1985; and Swamy, 1986). The transamination of glutamate is cababolized by Aspartate aminotransferase present in the liver, myotomal muscles and tissues. The increased glutamate content can be regulated by the action of the enzyme Aspartate transaminase. The host counteracts this situation by increasing the activity of aspartate aminotransferase for the continuous supply of Alanine and α-ketoglutarate required by the parasite.

Table. 1 Post helminth infection AAT activity level changes in the mytomal muscles of *Channa punctatus*

Parameter	Control	Organ of Infection	
		Liver	Intesitne
Content µ-moles of pyruvate/ mg of tissue/hr	0.04389	0.0665	0.04769
S.D	± 0.00358	± 0.00407	± 0.00227
Change		+ 0.02261	+ 0.0038
% Change		+ 51.5	+ 8.65
'P' value		< 0.1	< 0.1

Table. 2: Post helminth infection AlAT activity level changes in the mytomal muscles of *Channa punctatus*

Parameter	Control	Organ of Infection	
		Liver	Intesitne
Content µ -moles of pyruvate/ mg of tissue/hr	0.04683	0.0665	0.04769
S.D	± 0.00314	± 0.00407	±0.005109
Change		+ 0.01967	+ 0.0038
% Change		+ 42	+ 8.15
'P' value		< 0.1	< 0.1

This indicates the biochemical adaptation of the host to the metabolic needs of the parasites. The result obtained on the changes in the AlAT activity of myotomal muscles in *Channa punctatus* due to the liver infection by *Callodistomum diaphanum* and the intestinal infection by *Genarchopsis goppo* (Table. 2 and Fig. 2) suggest that the AlAT activity in myotomal muscles of the uninfected animal was 0.04683 ± 0.0314 µ moles of pyruvate/mg of tissue/hour and in infected animal this activity was 0.0665 ± 0.0407 and 0.04769 ± 0.00227 µ moles of pyruvate/mg of tissue/hour during liver and intestinal infections respectively. During Liver and intestinal infections the AlAT activity showed an increase by about 42% and 8% respectively.

AlAT activity increased during the intestinal and liver infection by *Genarchopsis goppo* and *Callodistomum diaphanum*. AlAT facilitates the transamination of α-keto glutarate and Alanine to produce pyruate and glutamate. Thus the glutamate and pyruvate increased in the body of host. The host counteracts this situation by increasing the activity of Alanine aminotransferase, for the continuous supply of Alanine and α-ketoglutarate required by the parasite. This also indicate the biochemical adaptation of the host to the metabolic needs of the parasites. (Kameswari (1978), Muralidhar Rao (1991), Bikshapathi (1992), Siva Rao (1992), Rasheedunnisa (1981). This pyruvate may be converted to glycogen through gluconeogenesis. Therefore, glycogen content become increased during helminth infections.

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