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Parasitology and Helminthology

Arginase in the Organs of Water Snake (*Natrix tessellata*, Laurenti, 1768) and Cestode (*Ophiothaenia europaea*, Odening, 1963) Parasitizing in it

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ABSTRACT. The activity of arginase in the organs of water snake (*Natrix tessellata*) and cestode (*Ophiothaenia europaea*) inhabiting its intestine was determined. pH optimums are established. It was shown that the greatest activity of arginase in water snake was noted in kidneys and the least activity was in the liver. No arginase was detected in the intestine. Considerable activity of the arginase of the parasite is established.

The role of biochemical adaptation of arginase in the system parasite-host is discussed. *© 2012 Bull. Georg. Natl. Acad. Sci.*

Key words: *Natrix tessellata, Ophiothaenia europaea, arginase.*

Studies of adaptational reactions in parasite worms to the habitation medium, have always interested the researchers dealing with biochemistry of helminths [1-3]. Helminths of warm-blooded and cold-blooded animals have often been the object of study. However, these processes have hardly been investigated in the endogeneous parasites of snakes and their hosts. Detection of the peculiarities of metabolism in the above animals is very important for comparative biochemistry, biochemistry of helminths and system parasite-host formation. We focused attention on arginase enzyme. A number of studies are devoted to arginase from different tissues of vertebrate animals. It is also found in the body of helminths of different classes and some researches connect the role of this enzyme with adaptation to parasitizing [2-5].

Proceeding from the integral system parasite-host we considered it to be necessary to determine the activity of arginase of both components using the example of water snake (*Natrix tessellata*, Laurenti, 1768) and cestode (*Ophiothaenia europaea*, Odening, 1963) parasitizing in its intestine). We aimed to find the values of enzyme activity in the organs of host and parasite. The peculiarities revealed are very important for a deeper understanding of interrelations in the system parasite-host.

Materials and Methods. The liver, kidneys and intestines of water snakes and cestodes *O.europaea*

served as material for the investigation. 5 exemplars of water snakes were brought from the territory close to Tbilisi water reservoir and 3 exemplars from the environs of Rustavi.

The animals caught near the water reservoir were all infected with cestodes (invasion intensity is 3-9 pieces), and animals brought from the environs of Rustavi were free of cestodes.

Out of fresh-frozen organs of water snakes and cestodes 2.5% and 5% water homogenates were prepared. After extraction in cold conditions homogenates were centrifuged at 3000 rev/min for 10 min. Sediment was thrown away and supernatant served as a source of enzyme.

The activity of arginase was determined according to the method of Khramov and Galaev [6]. The calculation was done by a calibration curve, constructed on dissolving the standard solution of urea. Specific activity was expressed in μg of urea per mg of protein for 1 hour at 37 °C.

Protein was determined by Lowry [7].

Results and Discussion. In homogenates of tissues of water snake and cestodes *O.europaea* arginase activity was revealed. Arginase helps to decay arginine to ornithine and urea. Enzyme activity is evaluated by the quantity of the latter. The results of evaluation are presented in Table 1. They show that maximal activity was detected in kidneys of the water snake (197.5±13.84 μg of urea/mg of protein/hour).

Arginase was absent in the intestine and its activity in the liver was quite low, totaling 7.31±0.89 μg of urea/mg protein/hour. Comparing the values of enzyme activity in the liver and kidneys of the snake one may say that high-active arginase is located in the kidneys. Abundant blood circulation ensures both their excretory function and intensive metabolism. Low activity of arginase in liver of the water snake can be explained by the fact that snakes and birds have no system of ureogenesis. Adaptation of these animals to the surface life led to the creation of uricotelism and formation of uric acid as the final product of protein metabolism.

Table 1. Activity of arginase in the organs of water snake and cestode *Ophiothaenia europaea* (at pH 9.5)

Object of investigation	Activity of arginase in μg of urea/mg protein/hour
Kidney	197.5±13.84
Intenstine	not revealed
Liver	7.31±0.89
O.europaea	35.95±6.24

Low activity value of arginase in the liver of water snake agrees with the data for arginase of chicken's liver obtained by Sokhina and Koloskova [2]. It should be assumed that liver arginase N.*tessellata* refers to the type of non-ureotelic arginases, which take part in the process of rendering ammonia harmless. Such arginase is an evolutionarily more ancient enzyme with a function independent of ureotelism. Some authors consider that while establishing the "ureotelism" in the liver of amphibians the specific ureotelic arginase is induced, which functions together with the present philogenetically more ancient non-ureotelic arginase [8,9]. Comparing the values of the activity of arginase of liver of the water snake and snake's cestode with the data for arginase of the chicken's liver and her parasite *Ascaridia galli* [2], we noted that these values are very close to each other (Table 2).

From this example we can see that arginine decay in the liver of birds and snakes occurs almost with equal intensity and their arginases possibly fulfill analogous functions. Adaptation of these animals to the medium with limited water content occurred in similar conditions and was reflected on nitrous me-

Table 2. Arginase activity in the liver of water snake and chicken, nematodes *Ascaridia galli* and cestodes *Ophiothaenia europaea*

Object of investigation	Activity of arginase in μg of urea/mg protein/hour
Liver of water snake	7.31±0.89
*Liver of chicken	8.62
Ophiothaenia europaea	57.05±7.97
**Ascaridia galli*	50.51

* According to Sokhina and Koloskova [2]