BIOCHEMICAL RESPONSES OF BIVALVE MOLLUSK UNIO TUMIDUS IN THE VICINITIES OF SMALL AND RUNOFF HYDROPOWER PLANTS

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Hydropower is the most important and most economically advantageous branch from the renewal sources of the electro power. However, the environmental suitability of hydropower plants (HPPs) does not based on the biomarker approach. Even the analysis of biological diversity in these areas is very scant. The evaluation of the biochemical responses of aquatic animals that are the early warning markers of the environmental impact unknown. The aim of the present study was the evaluation of the state of the systems of stress and specific markers of toxicity in the bivalve mollusk *Unio tumidus* in the technological water bodies of HPPs. The mollusks were sampled in the sites at the middle tributaries of the river Dniester from the sites upstream and downstream the dam of small HPP Kasperivska on the r. Seret (in two seasons) and micro runoff HPP on the r. Jbanchik (in summer).

The indices of the mollusks from two HPPs were distinct. Moreover, within the each area, the responses of the specimens from upstream and downstream areas were also different.The seasonal differences were found: the reducing of the superoxide dismutase (SOD) (by 1.8 – 2.5 times) and glutathione *S*-transferase (GST) (by 8.9 – 4.9 times) activities of the digestive gland of bivalve from the reservoir of small HPP from the summer to autumn with the prevalence of Mn-SOD in both seasons was established.

Lesser Cu, Zn- and Mn-SOD activities were found in the mollusks from the upstream sites, particularly at the micro-HPP. The highest level of the lipid peroxidation and lower lysosomal membrane stability were also detected in this group, attesting the oxidative stress in this group. We speculate that these manifestations were caused by the periodical changes of the water flow regime in this area and corresponding changes in the temperature regime.

The responses of the specific systems of detoxification indicated the signs of pollution in the specimens from the Kasperivtcy reservoir. The highest level of GST activity was indicatedin the digestive gland of the mollusks from thisreservoir in summer. The difference between the specimens habituated upstream and downstream dam sites for GST activity was about 1.9 times. This is the sign of the pollution by organic substances that initiate their biotransformation within the cellswith the utilization of GST. Interestingly, the total level of the glutathione was lesser in this group of mollusks attesting the exhausting of its activity. In the mussels from Kasperivtci reservoir, the oppression of cholinesterase (ChE) activity was shown attesting the neurotoxicity of the environment. The thiocarbamate and phosphoorganic substances that are used in the agriculture typically cause the depletion of ChE. The highest level of vitellogenin-like proteins in the gonads in this group is the sign of the pollution by endocrine disruptive chemicals in this reservoir. These substances could be the bisphenol A, and also the pharmaceutic substances that originated from the personal care activities. The level of metallothionein was also highest in the digestive gland of mollusks from the reservoir. This is the sign of the pollution by toxic metals, namely cadmium, copper, zinc.

The lysosomal activity of the cathepsin D was higher in the mussels sampled downstream the dam than before dam, and extra lysosomal cathepsin D activity or its rate to the total its activity was higher in the mussels upstream the dam in the both cases. Hence, the inducing of the lysosome-mediated apoptosis was evident, particularly in the mollusks from the reservoir.

To summarize, the responses of the bivalve mollusks confirm the evidence of the environmental impact of such reservoirs that magnified the pressing of the typical for freshwater adverse effects due to the change in water runoff.

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