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Serhii Matiushko

USE OF BIOMARKERS OF OXIDATIVE STRESS ON AQUATIC ORGANISMS TO DETERMINE THE STATE OF THE WATER

T.H. Shevchenko National University «Chernihiv Colehium»,
14017, Hetmana Polubotka str., 53, Chernihiv, Ukraine
E-mail: mekhedolga@gmail.com

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Introduction. Oxidative stress occurs when the level of free radicals in cells exceeds the body's ability to neutralise them with antioxidants. This phenomenon can be caused by various factors such as water pollution with toxins, increased levels of heavy metals or excessive use of pesticides [1, 5]. The use of biomarkers of oxidative stress in hydrobionts is used to determine the state of the reservoir, as oxidative stress is an important factor affecting the health and ecological state of water resources. We used methods for detection and measurement of biomarkers of oxidative stress in mollusc and fish organisms, such as the activity of catalase, superoxide dismutase, quantitative content of malondialdehyde, diene conjugates and others. The possibilities of using these biomarkers to determine the qualitative state of the water body and to identify the impact of various factors, such as water pollution and changes in the ecosystem, are very informative [2, 4].

Materials and methods To study the content of lipid peroxidation products in extracts of white muscle, gills, liver and brain of common carp. The method of determination of the specified substances in fish tissues was carried out according to the standard method using a set of reagents of the company "Filisit". Statistical processing of the research data was carried out using the Microsoft "Office Excel" 2010 application package with the use of Student's T-test.

Results and discussion. Studies show that molluscs and fish can be sensitive indicators of the condition of water bodies due to their response to oxidative stress. Biomarkers of such stress include increased levels of malondialdehyde, which is indicative of lipid peroxidation and can indicate the presence of oxidative stress and the activity of antioxidant enzymes - a decrease in the activity of enzymes such as superoxide dismutase and catalase is also an indicator of stress.

We found that the amount of malondialdehyde (MDA) was practically no different from the control values; a slight increase in this indicator was observed in all the tissues examined, but the differences are unlikely to be significant. The maximum changes in MDA content were found in the gills of the fish, reaching almost 34% under the influence of mycotoxin T2. In the brains of fish from the experimental groups, changes in the indicator were up to 30%.

In the white muscle of the fish, the indicator increases practically by a quarter, which indicates the sensitivity of this tissue to the influence of the toxicant. According to the data obtained, the maximum changes of diene conjugates were recorded in white muscles and gills. In particular, it was found that the content of diene conjugates in the gill tissues of almost all the groups of fish studied increased significantly compared to the control ($0.01 < P < 0.001$). In the white muscle of fish from the experimental groups, there was a tendency for the quantitative content of glutathione peroxidase to increase under the influence of mycotoxin (changes up to 18%), but these changes were not statistically significant.

The mycotoxin caused the most significant changes in the condition of the fish's liver and gills. Minimal abnormalities were observed in brain tissue. This tendency towards specific tissue changes became apparent when toxic substances were used in high concentrations. As a result of the influence of pollutants, there was an increase in the content of the studied substances in the tissues and organs of the common carp. The evaluation of this phenomenon makes it possible to determine the functional state of the organism and to identify the initial, still reversible stages of many diseases.

All these indicators of oxidative stress and the antioxidant defence system in terrestrial gastropods are important means of determining the adverse effects of pollution [3]. Changes in the tissues and organs of molluscs are probably related to the activation of oxidative stress, changes in energy reserves and/or disturbances in the endocrine system. In addition, these organisms show reactions to toxic substances, which makes them valuable in the diagnosis of environmental pollution. They are therefore recommended as useful bioindicators in ecotoxicological studies and monitoring programmes.

Conclusions. The use of biomarkers of oxidative stress in aquatic organisms provides a powerful tool for assessing the health of aquatic environments and detecting the presence of water pollution. Biomarkers such as lipid peroxidation, antioxidant enzyme activity and DNA damage provide insight into how organisms respond to various pollutants, including heavy metals, pesticides and industrial chemicals, which can induce oxidative stress. By analysing these biomarkers, researchers can determine the level of environmental stress on aquatic species, helping to identify the nature and severity of water pollution.

Aquatic organisms, particularly those that are sensitive to changes in water quality, serve as early warning indicators of environmental pollution. The physiological responses measured by oxidative stress biomarkers reflect both acute and chronic exposure to pollutants, making them highly effective in monitoring long-

term ecosystem health. These biomarkers are also valuable in assessing the effectiveness of pollution control measures and in formulating water management strategies to prevent further degradation of aquatic systems.

The use of biomarkers of oxidative stress in molluscs and fish is becoming an increasingly important tool for determining the ecological status of a reservoir. These methods can serve as a basis for the development of effective strategies for the management of water resources and the conservation of natural ecosystems.

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Olha Mekhed

CHANGES IN THE BIOCHEMICAL INDICATORS OF HYDROBIONTS IN RESPONSE TO THE TOXIC EFFECT OF MYCOTOXIN T2

T.H. Shevchenko National University «Chernihiv Colehium»,
14017, Hetmana Polubotka str. 53, Chernihiv, Ukraine
E-mail: mekhedolga@gmail.com

Keywords: *aquatic animals, biochemical indicators, mycotoxin T2*

Introduction. Aquatic ecosystems are increasingly exposed to various environmental stressors, including toxic contaminants such as mycotoxins. Mycotoxin T2, a potent trichothecene produced by certain species of Fusarium fungi, is known to be highly toxic to both terrestrial and aquatic organisms. When introduced into aquatic environments, mycotoxin T2 poses a significant threat to the health of hydrobionts - organisms that live in water, including fish, molluscs and crustaceans. Understanding how these organisms respond at the biochemical level to T2 exposure is critical to assessing the ecological risks associated with this toxin. Hydrobionts are highly sensitive to changes in water quality due to their constant interaction with the aquatic environment and can serve as valuable bioindicators of pollution. Exposure to T2 mycotoxin can disrupt normal physiological processes, leading to oxidative stress, changes in enzyme activity and damage to cellular structures. These biochemical