THE EFFECT OF BISPHENOL A ON THE LEVEL OF THIOBARBITURIC ACID REACTIVE SUBSTANCES AND CATALASE ACTIVITY IN *CORYNEBACTERIUM GLUTAMICUM*

Shchepanovska M.A., Vasina L.M.
Yuriy Fedkovych Chernivtsi National University,
shchepanovska.mariia@chnu.edu.ua

Abstract

The effect of Bisphenol A (BPA) on oxidative stress markers in Corynebacterium glutamicum was evaluated. A concentration-dependent increase in thiobarbituric acid reactive substances levels indicated lipid peroxidation. Catalase activity was also elevated, reflecting antioxidant system activation. These results suggest C. glutamicum as a potential biomarker for environmental toxicity and bioremediation studies.

Keywords: *bisphenol A, oxidative stress, Corynebacterium glutamicum, bioremediation*

Introduction. Bisphenol A (BPA) is a synthetic chemical compound primarily used as a monomer in the production of synthetic polymers. This pollutant is known to disrupt the endocrine system and is considered a potential toxicant for the nervous and reproductive systems [1]. BPA exposure has been shown to induce the formation of reactive oxygen species (ROS), which leads to oxidative damage of cellular components such as lipids, proteins, and DNA. Due to these properties, BPA raises concerns about its possible negative impact on human health and the environment. In the context of increasing environmental pressure, it is important to develop methods for pollution monitoring and bioremediation, particularly through the identification of biological indicators that can detect toxic compounds and contribute to environmental cleanup.

Corynebacterium glutamicum is a Gram-positive soil bacterium that possesses resistance to various xenobiotics and is capable of activating enzymatic detoxification systems. Due to these properties, *C. glutamicum* can potentially be considered a biological indicator for assessing toxic environmental load and, possibly, a promising candidate for further research in the field of bioremediation.

The aim of this study is to assess the effect of bisphenol A on the pro- and antioxidant system of *Corynebacterium glutamicum* by determining the level of TBARS and the activity of catalase as markers of oxidative stress.

Materials and methods. *Corynebacterium glutamicum* was cultivated in liquid nutrient medium with the addition of BPA at concentrations of 2.5, 5.0, and 7.5 mg/ml. The incubation lasted for 120 hours at a temperature of 37 °C. The level of thiobarbituric acid reactive substances (TBARS) was determined using a standard spectrophotometric method, involving thiobarbituric acid and subsequent measurement of optical density at 532 nm. Catalase activity was measured by the change in optical density at 450 nm after incubation with H_2O_2 and reaction termination with ammonium molybdate. The results were statistically processed.

Results and discussion. According to the results of the experiment, a dose-dependent increase in the level of TBARS was observed in *C. glutamicum* cultures exposed to bisphenol A, indicating the development of oxidative stress. Even at the lowest BPA concentration (2.5 mg/ml), the TBARS level doubled compared to the

control, which suggests the onset of lipid peroxidation. As the BPA concentration increased, the TBARS content also rose, reaching its maximum at 7.5 mg/ml, indicating enhanced lipid peroxidation and the progression of oxidative stress.

The simultaneous increase in catalase activity indicates the activation of enzymatic antioxidant mechanisms against oxidative stress (fig.1).

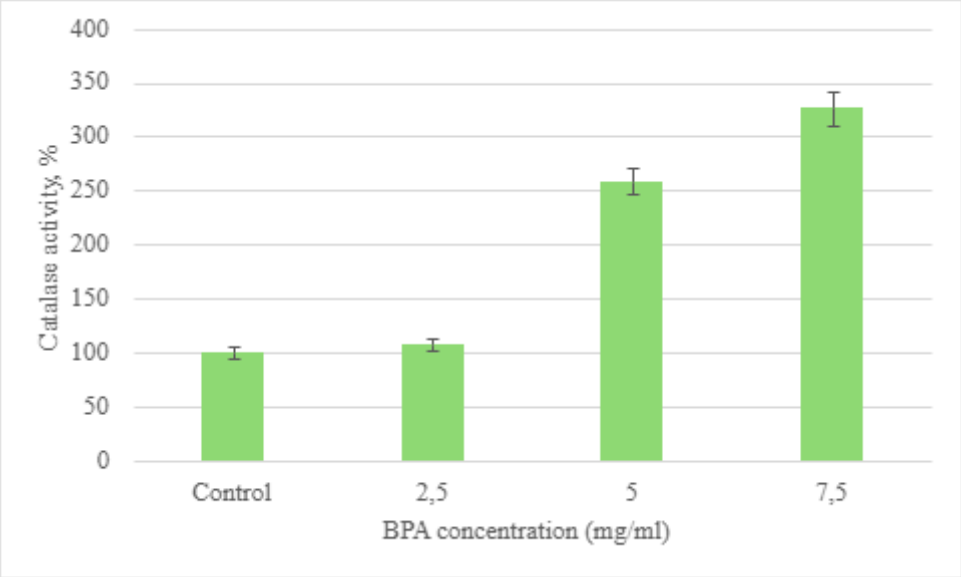

Fig. 1. Catalase activity of *Corynebacterium glutamicum* under bisphenol A (BPA) exposure at different concentrations.

Catalase plays a crucial role in mitigating the effects of oxidative stress by catalyzing the conversion of hydrogen peroxide, a major toxic byproduct of oxidative stress, into water and oxygen. This enzyme helps prevent potential cellular damage, thereby maintaining the stability of the cell. The rise in catalase activity reflects the organism's ability to counteract the harmful effects of BPA and restore the balance between the production and elimination of reactive oxygen species (ROS), which is essential for maintaining homeostasis and preventing further cellular damage [2].

Conclusions. The increase in TBARS levels and catalase activity indicates the activation of antioxidant mechanisms in response to oxidative stress induced by bisphenol A. The results highlight the potential of further studying *C. glutamicum* as a bioindicator for assessing the toxic effects of xenobiotics.

References:

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