THE INFLUENCE OF MICROCYSTIN-LR ON DNA DAMAGE AND REPAIR IN HUMAN PERIPHERAL BLOOD LYMPHOCYTES IN VITRO

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Microcystins are a family of potent hepatotoxins produced by several genera of Cyanobacteria. The excessive growth of these toxins in drinking-water sources is increasingly recognized as a risk to public health. It was noted that microcystins induce preneoplastic and neoplastic tissue changes in the liver, skin and colon. Since damage at the DNA level and deficiencies in DNA repair are included in the process of cancerogenesis, we decided to examine the influence of microcystin-LR (derived from the Sulejow Reservoir in central Poland) on DNA damage and repair in human peripheral blood lymphocytes cultured in vitro.

The comet assay was used to analyze DNA lesions and DNA repair kinetics in single cells after treatment with 25, 50 and 100 µM of microcystin-LR. Microcystins are inhibitors of protein phosphatases 1 and 2A, which are required for the activation of DNA-PK, and subsequently for DNA double strand break repair. Therefore, we examined the effect of microcystin-LR on the cellular response to ionizing radiation.

Lymphocytes treated with microcystin-LR for 1 hour showed no changes compared to the control sample in the comet assay. However, longer treatment with microcystin-LR caused a dose-dependent increase in the number of abnormal comets, indicative of apoptosis. Lymphocytes irradiated with 2 Gy ⁶⁰Co-rays showed a increased level of DNA damage. The repair of DNA damage after irradiation was time-dependent and comparable to the results available in the literature. The level of DNA repair in single lymphocytes treated with microcystin-LR and simultaneously irradiated with 2 Gy ⁶⁰Co-rays was decreased. These results suggest that microcystin-LR may inhibit the cellular DNA repair capacity.

This work was supported by KBN grant No. 6 PO5DO1320.