Biochemical and Cytological Studies on the Cyanobacterial Toxin (Microcystin-LR) Isolated from Microcystis Blooms in King Talal Reservoir

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Abstract

Toxic cyanobacteria have been recognized as a worldwide hygienic problem in recent years. Cyanobacterial samples were collected from King Talal Reservoir. *Microcystis* cells were isolated and maintained in laboratory cultures. The microcystin-LR, which is a potent hepatotoxic cyclic peptide produced by *Microcystis* cells and was extracted for the first time in Jordan, and analyzed using high performance liquid chromatography (HPLC). The HPLC results showed a peak of microcystin-LR which appeared after 2 min. at 238 nm. The mouse bioassay, using intraperitoneal (i.p.) injection of cyanobacterial extract, had been applied for toxicity assessment of microcystin. In further experiments, mice were injected intraperitonealy with extracted microcystin-LR, some were sacrificed after 6 and others after 12 hr later. Protein phosphatase-1 (PP1) was isolated from livers of normal mice to study the effect of extracted toxin on its activity. The results showed more than 50% inhibitory effect at 20 mg/ml of the extracted toxin on PP1. Furthermore, the effects of extracted microcystin-LR on liver architecture and organization of microfilaments were investigated. The livers of mice injected with 30 mg/ml of extracted microcystin exhibited morphological changes in the
liver architecture such as congestion of blood vessels, dilation of sinusoids and irregular nuclei as revealed by light microscope. Electron micrographs showed clear changes in the ultrastructure of hepatocytes of the microcystin-treated mice. These changes include accumulation of few lamellar bodies in mitochondria, scattering and vesiculation of rough endoplasmic reticulum, appearance of large number of lipid droplets and abnormal nuclear membrane. On the other hand, deformations of microfilaments were visualized by fluorescent staining of actin-filaments with coumarin-conjugated phalloidin. The results showed that *Microcystis aeruginosa* in King Talal Reservoir is a toxic species that produces microcystin-LR. Also, the results confirm the inhibition effect of microcystin-LR on the extracted PP1 besides its effect on the liver by reorganization of microfilaments and deformation of hepatocytes architecture.