Centre for Cyanobacteria and their Toxins

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"Cyanobacterial water blooms: effects, consequences and management"

BOOK OF ABSTRACT

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MICROCYSTIN BIOACCUMULATION AND BIOMARKER RESPONSES IN FISH EXPOSED TO CYANOBACTERIAL BLOOMS

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Effects of microcystin-producing cyanobacterial blooms on fish were investigated in breeding outdoor tanks. Phytoplanktivorous silver carp (*Hypophthalmichthys molitrix*) and benthophagous common carp (*Cyprinus carpio*) were exposed in experimental tank to bloom of *Microcystis aeruginosa* (containing microcystins in concentration 182 – 539 μg/g DW) for two months. Tank without bloom was used as a control. Fish were collected at the start of the experiment, after 4 and 8 weeks of exposure. Microcystin content was analysed in muscle and hepatopancreas of collected fish using ELISA. Effects on biochemical markers related to oxidative stress and detoxication were investigated in hepatopancreas of exposed fish and included concentrations of intracellular glutathione (GSH) and catalytic activities of glutathione S-transferase (GST), glutathione reductase (GR) and glutathione peroxidase (GPx). After 4 or 8 weeks of exposure, concentrations of microcystins in muscular tissue were 1.4 – 29 ng/g FW in silver carp and 3.3 – 19 ng/g FW in common carp. Concentrations of microcystins in the muscle did not differ significantly between fish exposed for 4 weeks or for 8 weeks. Hepatopancreas accumulated more microcystins than muscle. In silver carp, concentrations ranged between 35 – 226 ng/g FW and increased within duration of experiment (mean concentrations were 93 ng/g FW after 4 weeks and 124 ng/g FW after 8 weeks). On the other hand, concentrations of microcystins (29 – 218 ng/g FW) in hepatopancreas of common carp were higher (mean 132 ng/g FW) after 4 weeks than after 8 weeks (mean 69 ng/g FW). Also biochemical markers were significantly modulated after exposure to cyanobacteria. Concentrations of GSH were significantly elevated in both fish species exposed to cyanobacterial bloom, whereas induction of enzymatic activity of GST was observed only in exposed common carps (after 8 weeks of exposure). Activities of GPx and GR were modulated neither in common nor silver carps exposed to cyanobacterial bloom. Our results showed that microcystin can be accumulated in fish tissue at levels possessing human health risk. Exposure of fish to bloom was accompanied by changes of GSH and GST, probably associated with microcystin bioaccumulation. Common carp seemed to be more sensitive species as more pronounced effects on GSH and GST were observed at this species. Acknowledgement: Research was supported by project „AVOZ60050516“ granted to Institute of Botany and by the Ministry of Education C.R. (projects no. 1M6798593901 and no. MSM 62 15712402).