

# Inhibitory effects of *Microcystis aeruginosa* toxin on ion pumps of the gill of freshwater fish

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A microsomal fraction enriched in ion pump enzymes was isolated from the gill of the carp (*Cyprinus carpio* Linneo). Mg<sup>2+</sup>-dependent (Na<sup>+</sup> + K<sup>+</sup>), Na<sup>+</sup>, HCO<sub>3</sub><sup>-</sup> and Ca<sup>2+</sup>-stimulated ATPase activities were studied following treatment with microcystin-LR-like toxin, the major toxic component isolated from *Microcystis aeruginosa* culture. These enzyme activities were inhibited in a dose-dependent manner. The maximum inhibition of each enzyme, induced with nM concentration of the toxin, was similar to that produced by inhibitors specific for each ATPase activity. The Mg<sup>2+</sup>-ATPase activity and non-specific hydrolysis of ATP were unaffected. These results strongly suggest that the massive fish death during *M. aeruginosa* blooms may result from the loss of ion homeostatic processes produced by the inhibitory action of microcystin on the ion pumps of gill chloride cells. © 1993.