

RESPONSE PATTERNS OF BIOMARKERS IN DIFFERENT FISH SPECIES EXPOSED TO MULTICOMPONENT METAL (Cd, Cr, Cu, Ni, Pb and Zn) MIXTURE

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Toxicity to fish of multicomponent metal mixtures at maximum-permissible-concentrations (MPC: Cd – 0.005, Cr – 0.01, Cu – 0.01, Ni – 0.01, Pb – 0.005 and Zn – 0.1 mg/L) set for EU inland waters was evaluated using the whole-mixture approach. The study on the biological effects of multicomponent metal mixtures on three ecologically different fish species, i.e. *Perca fluviatilis*, *Rutilus rutilus*, and *Salmo salar*, which are valuable bioindicators for monitoring water pollution, is reported. The aim of this study was to assess response patterns of biomarkers (erythrocytic nuclear abnormalities (ENAs), metal accumulation and metallothioneins) in tissues of ecologically different fish species following 14-day treatment with multicomponent metal mixtures at MPC and multicomponent metal mixtures with one of its components (single-metal) at reduced MPC (↓). Tissues of all tested fish species demonstrated different patterns of metal accumulation. After treatments with Cu↓ and Cr↓, the lowest amount of Ni was found in all tissues (except the liver) of all the three fish species tested. After Zn↓ and Pb↓ treatments, the amount of Ni in muscle of all the tested fish species significantly decreased. The highest amounts of Cr in gills and Pb in muscle were detected in all the tested fish species after treatments with Ni↓ and Cd↓ mixtures, respectively. *R. rutilus* accumulated significantly larger amounts of metals than *P. fluviatilis* and *S. salar*. The data obtained show that tissues of the omnivorous *R. rutilus* exposed to metal mixtures accumulated higher amounts of Cr, Cu, Ni and Zn, while tissues of the exposed carnivorous fish *S. salar* and *P. fluviatilis* higher amounts of Cd and Pb. The analysis of ENAs revealed concentration-dependent responses, indicating Cu↓ and Cr↓ treatments as causes of higher geno- and cytotoxicity levels. Our study highlights the impact that even changes in low metal concentration (MPC) exposure have on increased geno-, cytotoxicity risk in erythrocytes of *S. salar* and *P. fluviatilis* as well as on changes in accumulated metal amounts in all fish species.