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INVESTIGATIONS OF THE EFFECT OF COPPER ON MICROORGANISMS OF THE DIGESTIVE TRACT OF FISH

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Copper is an essential trace element for all living organisms, but may be toxic at high concentrations. Major sources of anthropogenic copper in the environment include: domestic effluents, industrial wastes, smelting and mining activities and antifouling points.

It is clear that elevated levels of heavy metals can alter the qualitative as well as the quantitative structure of microbial communities. Unfortunately, we know very little about the environmental concentrations of metals that are required to bring about these changes. Toxic substances are accumulated through nutrient links and direct absorption mostly in the digestive tract, liver, kidney of hydrobionts (Hernandez-Hernandez et al., 1990). Therefore, investigations of the functional activity of microflora, in accordance with the indices of its vital activity in ecosystems of various nature and different degree of pollution, are urgent. The aim of the present study was to examine short-term (96 hours) and long-term (3 months) copper effect on qualitative and quantitative indices of microorganisms from the digestive tract of rainbow trout.

The experiments were carried out in 1993 in the Aquarium of Institute of Ecology. The fish under study were undergearing rainbow trout (*Oncorhynchus mykiss*) 10.8-12.2 cm of total length and 25-30 g of total weight, obtained from Žeimena hatchery. The fishes were kept in holding tanks of about 1000 l capacity supplied with flow-through aerated water of average total hardness 250 mg/l as CaCO_3 and pH 7.5. For experiments, the fishes were transferred from the holding tanks to aquaria of 40 l capacity and kept in the new medium until acclimation. The water temperature during experiments was 11-12 °C, the amount of O_2 8-10 mg/l.

Chemically pure copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) dissolved in distilled water was used as a stock solution, the final concentration being recalculated according to the amount of copper ion.

We have established that a long-term exposure of fish to 0.1 and 0.2 mg/l copper influences the cenosis of intestinal microorganisms of fed fish: compared to the control the number of microorganisms in the intestines of rainbow trout decreased.

The data obtained have shown that intestinal microorganisms of starved rainbow trouts response to even lower concentrations of copper. Compared to the control the number of intestinal microorganisms in rainbow trouts decreased when exposed to 0.750 and 0.375 mg/l of copper. However, fluctuations of bacterial numbers were not significant among variants.