THE EFFECT OF COMMON SURFACE WATERS CONTAMINANTS, PESTICIDE ROUNDUP AND DRUG CHLORPROMAZINE, IN THE ENVIRONMENTALLY RELEVANT EXPOSURES ON THE BIVALVE MOLLUSK *UNIO TUMIDUS*

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Bivalve mollusks represent the most recognized bioindicators of the surface water chemical pollution and climate changes. However, the specific responses of mollusk to certain xenobiotics are not well understood and examined mostly in the experimental acute exposures to single substanses in the environmentally impossible high concentrations. This study aimed to compare the subchronic impact of common aquatic pollutants in the single and combine exposures utilizing the low environmental concentrations and to reveale the common and particular responses. Both selected substances, herbicide Roundup (the commercial composition of glyphosate) and drug chlorpromazine, are the pollutants of priority. Both substances are expected to impact the metal homeostasis, namely calcium uptake and zinc (Zn) metabolism with the realtion on the general transporting systems. Elevated temperature was shown to exacerbate the toxicity or distort effects of xenobiotics in different exposures of bivalve mollusks including the mixture contained Roundup. However, the limits of adaptive responses to combine effect of pollution and the temperature extreames are not well understood now.

We studied the effect of Roundup (Rn) and chlorpromazine (Cpz) in the single (17 μg L^{-1} and 18 μg L^{-1} respectively at 18° C) and combine (Rn at 25° C (RnT) and RnCpz) exposures during 14 days on the mussels *Unio tumidus*. Digestive glands were examined. We applied the multi-marker approach that included the evaluation of specific responses to organic pollutants (biotransformation activities) and common oxidative stress and Zn metabolism responses. The vitality was eva;uated from the lysosomal membrane stability.

Shared signs of hormetic-like response were indicated in all groups as the increase of the level of Zn-metallothioneins and antioxidant activity (ABTS*). All exposures except Rn, caused the common responses: the increase of the GSH/GSSG ratio, protein carbonyls, CYP450 related activity (EROD) (by 3 times in RnT- and Cpz-groups), and up-regullation of citrate synthase activity. On the other hand, metallothionein protein concentration was enhanced in all groups except Cpz. Cholinesterase and caspase-3 activities increased simultaneously in Rn- and RnCpz- groups. GST changed differently in Rn- and Cpz-groups. Its activity was enhanced by Rn and decreased by Cpz. Highest injury was indicated in the RnT-group due to the decrease of Zn total concentration (Zn-t) and lysosomal integrity. According to Discriminant function analysis, Cpz caused strongest differences decreasing Zn-t, GST activity and increasing lysosomal integrity. Moreover, combine exposures abolished the individual responses. Summarizing, environmentally realistic complex exposures can enhance the resistance of antioxidant defence with involving of Zn-thiolome, but the heating limited the resistance. Multy-marker expertise with application of integrated indexes has benefits in the indication of inpredictable effects of complex exposures.

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