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THE IMPACT OF THE DANUBE RIVER POLLUTION ON BIOMARKERS RESPONSE IN THE LIVER AND GILLS OF COMMON BREAM ABRAMIS BRAMA (L., 1758)

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The Danube, the second largest river in Europe, is of great importance for all the countries in the basin for production of drinking water, water supply for domestic, agricultural and industrial purposes. Along the stream, the river receives incompletely treated or untreated wastewaters, which deteriorates its quality. Measurements of physico-chemical, chemical and microbiological parameters are considered the basis of monitoring because they cover a wide spectrum of information for proper water management. However, aquatic ecosystems are often exposed to different pollutants which may exhibit harmful effects on different levels of biological organization. Fish are widely used bioindicators in ecogenotoxicological studies, because of their position in the aquatic trophic chain and importance in human diet.

This research was conducted on the Danube River locality Višnjica, situated on the right river bank (1162 rkm), one of the main hotspots of fecal pollution. Discharge of the largest waste water collector in the capital of Serbia, Belgrade, which receives domestic and industrial waste, is situated a few km upstream of the sampling site. Sampling was performed in February, April, August and November 2014, with the aim to evaluate the impact of seasonal variation on water quality parameters and response of biomarkers in the common bream (Abramis brama). Water quality was assessed by using basic physico-chemical parameters and microbiological indicators of fecal pollution. In gills and liver of bream, metal and metalloid concentrations were assessed as an accumulation biomarker, comet assay was applied to assess DNA damage as a biomarker of exposure, while histopathological analysis was performed as a biomarker of effect.

According to number of Escherichia coli and enterococci critical and excessive level of fecal pollution was present on the site, indicating the presence of high amounts of untreated waste waters. During the entire period gills had higher concentrations of metals and metalloids in comparison to the liver. Both tissues showed the highest metal accumulation and the highest level of DNA damage in August, which may be attributed to increased activity and feeding during summer, but also to low flow rate and water level which may increase pollutant concentrations in the river. The highest level of histopathological alterations in the gills was recorded in November and in liver in April, probably due to higher level of precipitation during these months and introduction of pollutants through the urban and agricultural runoff. In terms of elements concentrations and DNA damage gills were more affected, while in terms of histopathological alterations liver had higher level of histopathological alterations. These results showed that urban wastewaters have a high potential in inducing genotoxic and histopathological effects in fish, and highlighted the urgent need for implementation of wastewater treatment facilities.