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Identification of hotspots of genotoxicological and faecal pollution along the Danube and Sava rivers – the whole river surveys

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The level of genotoxic pollution was assessed along the Danube River and its most significant tributary Sava River by measuring the level of DNA damage in aquatic organisms collected from the selected sites. The Danube River survey was conducted within the Joint Danube Survey 3 project in 2013 on 34 sites along the 2285 rkm using mussels (Unio sp.) and fish (Alburnus alburnus) as bioindicators. The Sava River survey was conducted within the Globaqua project in 2015 at 12 sites along 900 rkm using fish (A. alburnus/Alburnoides bipunctatus) as bioindicators. The level of DNA damage was evaluated by the comet assay in haemocytes of mussels and blood cells of fish.

The level of faecal pollution along the rivers was studied in parallel with genotoxicological surveys by using the standard indicators, total coliforms, Escherichia coli and Enterococci. Quantification was performed with Colilert/Enterolert Quanti-Tray 2000 and MPN approach. Quantitative PCR (qPCR)-based assays for analysis of human- or animal-associated genetic Bacteroidetes faecal markers have been used for tracking the source of pollution (microbial source tracking -MST). The human-associated BacHum and HF183II, the ruminant-associated BacR and the pig-associated Pig2Bac fecal markers were selected. The hotspots of faecal pollution were detected at both rivers. Presence of pollution was especially evident in the countries in which the legislation related to wastewater treatment and management is not fully implemented. In the case of the Danube River the most critical section of the river was the Pannonian plain (sector VI) while in the case of the Sava River the most affected section was the lower stretch of the river. The results of MST revealed the presence of human-associated fecal markers BacHum and HF183II in the majority of the analyzed samples. High correlation was observed between the standard fecal indicators and human associated faecal markers. Within the Danube survey, the highest levels of DNA damage were recorded in organisms from the section VI, which is under the impact of untreated wastewater discharges. In 2013 the Sava River was characterized with a lower level of both faecal and genotoxic pollution in comparison with the Danube. Similar observations were found within the Sava River survey in 2015 where the level of DNA damage in fish specimens from Sava was lower in comparison with the samples from the Danube. At both rivers detected genotoxic potential was traceable to the deterioration of quality by communal and industrial wastewaters.

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