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Microfibers in the Tiber River: a case study in Rome

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Rivers are the major pathways of plastic waste from land to the oceans. It has been established that cities with high population are mostly responsible for the increasing microplastic contamination of the aquatic environment. As it was demonstrated in our former studies focused on the investigation of suspended solids emitted by a municipal wastewater treatment plant into the Danube River at Budapest, the microfiber emission plays the dominant role. Since for the living organisms both the biodegradable and the chemically resistant particles and fibers are harmful, both the natural and artificial microfibers should be considered as toxic contaminant. Within this study, we aimed to determine the microfiber concentration as indicator of the “urban effect” in the upstream and downstream of Tiber River at Rome.

During the sampling campaign in February 2023, 10 L water samples were collected from the surface layer (10-50 cm) of the river in the upstream at the bridge Ponte Grillo and in the downstream at the bridge Ponte Magliana. The water samples were filtrated applying Whatman glass fiber filters with pore size of 0.7 µm. To remove the biofilms and organic residues from the surface of suspended solids (natural and plastic microfibers, fragments, mineral particles), the loaded filters were treated with hydrogen peroxide (30%) for 7 days. The particles were investigated individually after their removal from the filters by microtweezer. For characterization of particles, their size (length and diameter), shape, colour and texture were investigated by Nikon stereo-and polarization microscopes. The chemical composition was determined by means of FTIR spectrometer. in transflection mode. A total of ~ 2000 items were characterized. Both cellulose-based and plastic fibers were identified along the river. Higher proportion of natural cellulose-based fibers was registered. However, our observation does not harmonize with the data of textile industry reports. This unexpected phenomenon can be connected to the inefficient removal of cellulose fibers originating from the toilet papers emitted by municipal wastewater treatment plants located in the bank of the Tiber. The expected “urban effect” on the water quality was clearly detected.