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BIOACCUMULATION OF POLLUTANTS IN RIVER BIOFILMS

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ABSTRACT: Biofilms are one of the oldest and most common life forms on this planet. They can be found in natural environments and human-mediated environments. Their main characteristic is the ability to attach to and colonize different surfaces where other organisms cannot thrive. Another important feature is their capacity to absorb substances, including nutrients, organic matter and pollutants. They could indicate the presence of pollutants in the natural environment, due to their absorption capacity. The main goal of this research is to use a biofilm sampler to collect biofilm from two sampling points in a river in southern Germany: one upstream and one downstream a small WWTP to assess the accumulation of polycyclic aromatic hydrocarbons (PAH) and per- and polyfluoroalkyl substances (PFAS). Sediment samples were also analyzed. The target compounds were 16 PAH and 20 PFAS, analyzed by GC-MS/MS and HPLC-MS/MS, respectively. 14 PAH were detected in the samples. PFAS were not detected in biofilm and sediment. However, the values detected for the biofilm and the sediment samples showed higher concentrations downstream of the WWTP. The concentrations in biofilm samples were usually higher, but the accumulation (difference between upstream and downstream concentrations) in sediment was higher for most compounds. For some compounds, the concentrations downstream of the WWTP were two times higher than upstream. One explanation for this could be the high partition coefficient (log Kow) of PAHs, meaning that they tend to adsorb to organic matter and have low solubility rates. Since the sediment has higher organic matter content than biofilm, the accumulation in the sediment is also higher. However, the biofilm would still be suitable for monitoring purposes. The biofilm sampler was efficient and the amount of biofilm collected was enough for a range of advanced analyses. Biofilm is an adequate choice of matrix for time-integrating analyses. Research with other substances and over longer periods should be performed.

Keywords: PAH. PFAS. Chromatography.

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