

The functional role of biofilms in aquatic ecosystems

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Environmental biofilms are complex, surface-associated communities of microbiota (bacteria, algae, fungi, protists, small metazoans) and their extracellular polymeric substances (EPS). The densities of active organisms within biofilms are often several orders of magnitude higher than in planktonic systems and, correspondingly, the contribution of biofilms to microorganism-mediated ecosystem processes is high. Furthermore, biofilms create their own microenvironment with steep gradients (e.g. redox gradients) allowing different transformation processes in close proximity. Besides chemical transformation processes, biofilm biomass alters hydraulic processes, e.g. within hyporheic or deep aquifer habitats. Taking the fact that central biogeochemical and hydraulic processes are regulated by these complex biological systems, which in turn are controlled by their chemical and physical environment, the understanding of the mutual interactions between biofilms and their abiotic environment is essential. Behind this background, three topics are, among others, in the focus of current environmental biofilms. These are (i) the role of biofilm community complexity for total biofilm processes, (ii) the scaling of biofilm processes to ecosystem-wide processes and (iii) the control of biofilm structure and functioning in the environment. The presentation will summarize present knowledge on the functional role of biofilms within aquatic ecosystems with special focus on these three research topics.