University of Zurich[UZH]

eawag aquatic research

Department of Chemistry

Master Thesis

Bioaccumulation in stream biofilms

Description:
Natural stream biofilms are composed of algae, bacteria, fungi and small protozoan species, which are embedded in an extracellular polymeric matrix. Such riverine biofilms are among the most important and dominant microbial life-forms within streams and rivers, regulating crucial ecosystem processes as, e.g., ecosystem respiration. They also contribute to bioremediation of aquatic habitats by removing anthropogenic pollutants from the water through biotransformation and sorption. However, so far, there are only few studies addressing bioaccumulation of small polar organic micropollutants in biofilms. In previous experiments done in our group, evidence was found that certain compounds tend to bioaccumulate in stream biofilms. However, the mechanisms involved in this process are not fully understood.
This project aims to get more insight in the process of bioaccumulation of polar organic micropollutants in stream biofilms and to close the existing knowledge gaps.

Project:
The project will consist of three major parts: I) Based on previous experiments, the student will develop an experimental protocol to differentiate between sorption (extracellular) and bioaccumulation (intracellular) in stream biofilms. To do so, the biofilm matrix will be split into large, eukaryotic cells, small, prokaryotic cells and extracellular polymeric substances. Those three different compartments will then be used to do bioaccumulation experiments. II) The student will test bioaccumulation in standardized lab experiments with a set of polar and ionizable organic micropollutants. This part of the project is planned to be conducted with pure algae cultures, in order to investigate the potential of algal sorption/bioaccumulation. III) In a last step, the student will carry out a field sampling campaign in order to evaluate bioaccumulation in natural streams.
The MSc student will learn how to properly plan and set up an experiment, will gain knowledge in sophisticated analytical methods (HPLC-HRMS), and learn how to handle and evaluate large chemical and biological datasets.

Keywords: Bioaccumulation, sorption, pesticides, pharmaceuticals, field work, extraction, microorganisms

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