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Interactions between dissolved organic matter and PFAS during drinking water treatment

Masters Project

Department of Ecology & Genetics, Limnology Department (Evolutionary Biology Center)
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Collaborations with **Lutz Aherns** (SLU, Ultuna), **Philipp Wanner** and **Tabea Mumberg** (Gothenburg University) and multiple drinking water suppliers.

Background

Per- and polyfluoroalkyl substances (PFAS) are human-made chemicals that have been used in industry and household products since the 1940's. These chemicals are used in a wide range of applications including to make cooking materials non-stick, make fabrics stain resistant and are found in the foam used for firefighting. PFAS are now found everywhere in the environment, in water, air, soil and fish and long-lasting chemicals that persist in the environment. There are more and more studies linking PFAS exposure to harmful health effects in humans as well as other animals in the environment and thus there are efforts to reduce their concentrations in treated drinking water.

Recently, there has been a proposed reduction of PFAS concentrations by the Swedish Food Agency (Livsmedelsverket) in drinking water to 4 ng/L starting from 2026, which is substantially lower than the previous limit of 90 ng/L. Accordingly, drinking water providers are exploring innovative methods to remove PFAS from source waters also during artificial infiltration. Since much of the drinking water in Sweden comes from surface waters, drinking water suppliers also put effort into removing natural organic matter. Organic matter includes a wide range of natural compounds and are the degradation products of plant and animal life. Most of the organic matter from terrestrial systems, but some is produced with aquatic ecosystems. Many of Sweden's source waters contain levels of organic matter higher than the proposed limit of 4 mg/L. The removal efficiency for organic matter depends on the treatment approach as well as the composition of the organic matter. Thus, it is relevant to consider how innovative drinking water treatment approaches influence the removal efficiency of PFAS as well as concentration and molecular composition of dissolved organic matter (DOM) found in source waters.

Project Description

This master's project will involve setting up soil columns with the sand used for artificial infiltration. The lab study will attempt to mimic the same sand and environmental conditions found at infiltration sites at two drinking water treatment plants. The study will involve testing the removal efficiency of both PFAS and DOM under different conditions. This includes different levels of DOM and different sources of DOM as well as different temperatures typical of Swedish seasons. All the experiments will be developed in collaboration with partners at Gothenburg University, the Swedish University of Agricultural Sciences (SLU, Ultuna) and drinking water providers with similar set-ups.

Desired Qualifications

We are looking for an enthusiastic individual with a background in environmental studies, ecology and/or engineering who is interested in societally relevant issues such as drinking water quality. The master's candidate will help design and build the experimental column set up and analyze water for DOM analysis, and help with preparing samples for PFAS analysis. The candidate would ideally have a drivers license (but not necessary) and be able to work collaboratively with as part of research team.

Start Time

We are looking for a Master's student to start working on the project in **September of 2023**.

Contact Information

Please contact dolly.kothawala@ebc.uu.se for more information.