



## **BSc/MSc Thesis in Environmental Chemistry**

### **Title of Thesis: Assessing biotransformation product formation during activated sludge treatment**

#### **Description / Project:**

Complex mixtures of trace organic contaminants (TrOCs) resulting from human activities and released into the environment pose a significant threat to ecosystems. Microbial biotransformation holds potential for removing these contaminants, but there is limited mechanistic understanding of the factors driving this process. Activated sludge treatment in wastewater treatment plants (WWTPs) serves as a partial barrier to prevent TrOCs from entering the environment, yet treatment efficiency varies among compounds and facilities.

In this project, we are first determining the biotransformation capacity of activated sludge for 200 TrOCs, including common pharmaceuticals and pesticides. To achieve this, we will conduct a 72-hour lab batch assay using activated sludge from a typical wastewater treatment plant. We will spike the sludge with our target TrOCs and measure the concentration over time using HPLC-MS to determine the biotransformation rate constants.

Next, we will aim to assess and characterize the transformation products (TPs) formed during the biotransformation experiment, using the Compound Discoverer software on our MS data. We will then explore the agreement of the found TPs with predicted transformation pathways based on [enviPath.org](http://enviPath.org).

#### **Methods:**

**Preparation and execution of a four-day biodegradation assay with activated sludge in the lab (3 weeks). Measuring with automated HPLC-MS, including method development (3-4 weeks). Analytic evaluation of the MS-data using Skyline and R (2 weeks). Assessment and characterization of TPs using Compound Discoverer.**

#### **What we expect from you:**

**Students with specific interest in (environmental) analytic chemistry. No prior knowledge of Skyline, Compound Discoverer, or R is required.**

**Starting date: Late summer/autumn 2024**

**Responsible IfC professor: Prof. Kathrin Fenner (Universität Zürich und Eawag)**

**Supervisor / Contact:**

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