Universität Zürich[UZH]

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Department of Chemistry (UZH) &
Department of Management, Technology, and Economics (ETH Zurich)

Interdisciplinary MSc Thesis on chemical innovation

Title of Thesis: Evaluating the role of chemical persistence testing in pharmaceutical drug development: A case study

Description / Project:

The newly revised EU Wastewater Directive introduces the "contributor pays" principle, placing greater responsibility on pharmaceutical companies to monitor, treat, and reduce their chemical outputs into wastewater treatment plants. If these chemical outputs contain difficult to degrade (persistent) compounds, the company responsible for them will need to contribute financially to ensure appropriate removal of the chemicals.

Despite regulatory frameworks like REACH and testing guidelines e.g., by the OECD, gaps remain in understanding how companies address persistence during chemical innovation processes in practice, and what drives and hampers the implementation of advanced testing methods. Partly due to throughput limitations of the regulated persistence assessments, active pharmaceutical ingredients (APIs) are often tested only at later innovation stages. At Eawag, a novel method has been developed that can assess the persistence of hundreds of chemicals within days rather than months, enabling earlier evaluation and steering chemical design toward more sustainable final products.

This master's thesis will investigate the role of persistence testing in chemical innovation processes, with an initial focus on drug development in the pharmaceutical industry. The project aims to identify current practices, drivers, and barriers influencing the broader implementation of persistence testing. The findings will help bridge the gap between regulatory requirements, scientific testing methods, and industrial practices.

Methods:

The student will begin with a literature review and market analysis to map the past, present, and future technical approaches and regulatory requirements to chemical persistence testing. A period at Eawag will provide the student with technical hands-on-insights into a newly developed persistence testing method. This will be followed by industry interviews to assess the current implementation of persistence testing methods, as well as firm-level drivers and barriers to integrating such testing into their innovation processes. The findings will be synthesized to describe the opportunities and limitations for advancing persistence testing standards in the pharmaceutical industry, considering technical, socio-economic and political factors.

What we expect from you:

We are looking for a student with an interdisciplinary skillset and interests covering natural sciences and social sciences (e.g., chemistry/chemical engineering/environmental sciences and economics/political sciences). We consider university level courses and practical experience, such as relevant internships.

Your application:

please share with us at your earliest convenience (1) Letter of motivation (2) CV with the contact details of one referees; (3) BSc & MSc transcripts. We evaluate applications on a rolling basis and the position will remain open until it is filled.

Starting date: Preferably oct 2026, but can be discussed.

Responsible professor: Kathrin Fenner (UZH/Eawag) (and/or) Catharina Bening (ETH, Group for Circular Economy)

Supervisors / Contact:

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