**Mechanisms and causative agents of amine biotransformation in activated sludge**

Rebekka Gulde1, 2,Yujie Men1, Stefan Achermann1, 2, Kathrin Fenner1, 2

1 Eawag, Swiss Federal Institute of Aquatic Science and Technology, 8600 Dübendorf, Switzerland, kathrin.fenner@eawag.ch

2 Department of Environmental Systems Science (D-USYS), ETH Zürich, 8092 Zürich, Switzerland

The activated sludge stage of wastewater treatment plants (WWTPs) is key in reducing the loads of contaminants entering our surface water bodies. However, there is considerable variability in how well contaminants are removed during wastewater treatment, both amongst different compounds and for a given compound between different WWTPs. Many of the compounds entering wastewater contain an amine functional group, particularly human pharmaceuticals, but also a number of biocides and surfactants. Therefore, for the last four years, we have intensively studied the rates and biotransformation pathways of amine-containing compounds in order to understand to what extent activated sludge communities transform amines and structurally related contaminants (e.g., their metabolites and transformation products), and what mechanisms could potentially be leveraged to improve their removal. We believe that some of these findings extend beyond just amine biotransformation.

In this presentation, we will therefore summarize what studying amine biotransformation pathways in activated sludge communities has taught us on the underlying mechanisms and causative agents that is of relevance also for understanding the biotransformation pathways and rates of other chemical classes. In particular, we will focus on three aspects: First, amines will serve as an example to discuss the underlying mechanisms of the often-observed pH-dependence of the biotransformation rates of ionizing micropollutants (Gulde et al. 2014). Second, we will present results from a series of pure culture and inhibition studies to shed light on the relative importance of ammonia-oxidizing versus heterotrophic microorganisms for the biotransformation of amines and structurally related compounds in activated sludge (Men et al. 2015). Finally, we will explore several hypotheses for the frequently observed decrease of the biotransformation rate of amines during biotransformation batch experiments, including the potential for the formation of toxic biotransformation intermediates (suicidal metabolism) or the reversible formation of the parent compound from a biotransformation intermediate (on-going work).

Gulde, R. et al. (2014). pH-dependent Biotransformation of Ionizable Organic Micropollutants in Activated Sludge.*Environmental Science and Technology* **48**, 13760−13768.

Men, Y. et al. (2015). Micropollutant biotransformation in pure cultures and specifically inhibited nitrifying activated sludge further reveal the roles of ammonia oxidizing microorganisms (AOA and AOB).*In preparation*.