Eawag
Überlandstrasse 133
8600 Dübendorf
Switzerland
Phone +41 (0)58 765 53 61
Fax +41 (0)58 765 53 75
info@eawag.ch
www.eawag.ch

Seminar Invitation

From genetic screens to genetic engineering: Understanding and manipulating microbial functions

Speaker **Dr Olga Schubert, Senior Scientist, Department of Environmental Microbiology, Eawag / ETH**

When **November 30, 2021, 16.00 – 17.00**

Where Online via Zoom, contact admin.umik@eawag.ch for access details

Abstract This talk is structured into two parts in which I will discuss how we can use genetics to advance our understanding of the molecular biology of a microbial cell (part I) and to engineer microbes to address a pertinent environmental problem (part II).

Part I: The genetics of protein abundance in yeast characterized by large-scale CRISPR base editing. Protein abundances are extensively regulated both transcriptionally and post-transcriptionally. However, we do not have a comprehensive understanding of how the regulation of protein abundance is encoded in the genome, for example, how many genes affect each protein or whether proteins are more affected by specific or broad regulators. To address this question, we developed a genetic screen using a CRISPR base editor to study the effects of 16,452 genetic perturbations on eleven selected yeast proteins representing a variety of molecular and cellular functions. We uncovered hundreds of regulatory relationships, many of the previously unknown, together forming a highly interconnected network. In this talk, I will discuss general findings on protein regulation and highlight some of the novel regulatory relationships that we identified.

Part II: Towards synthetic microbial plastic degradation. Accumulation of PET waste in landfills or terrestrial and aquatic ecosystems is a major concern. Therefore, better incentives for PET recycling or safe options for PET disposal are urgently needed. Here, we aimed to endow a bacterial chassis with the capacity to depolymerize and metabolize PET plastic, thereby facilitating consolidated bioprocessing of PET waste. We first engineered the industrial workhorse Pseudomonas putida with the ability to metabolize the building blocks of synthetic polyester plastics as sole carbon sources. We then designed and tested a variety of systems for the expression of PET-degrading enzymes to allow P. putida to break down the polymer into its constituent parts. Lastly, we integrated these enzymes in the engineered chassis. While the PET-degrading capacity of this system is still limited and requires further optimization, we obtained promising results with the more readily biodegradable PET-alternative PBAT, highlighting the potential of this approach.