



Bacteria with a craving for plastic: a potential use of landfill leachate

The fight against plastic pollution is of high scientific, technological and, above all, social relevance. The constantly increasing plastic production and the low recycling rates result in large amounts of plastic waste, which represents an environmental and resource problem, in Tyrol but also worldwide. Our project focuses on an innovative method to turn plastic waste into valuable raw materials. As a first step, we explore microbes and their enzymes to break down plastic waste. To find these microbes, we explore landfills, since they are an ideal reservoir for such plastic-munching bacteria.

The overall goal of the study, which is carried out in partnership with the waste management company Abfallwirtschaft Tirol Mitte (ATM) GmbH, is the **examination of leachate from the retired landfill site in Graslboden, Tirol for potential plastic-degrading microbes.**

We will use the latest **metagenomics** methods to extract genetic material directly from environmental samples and to create high-resolution profiles of microbial communities that will allow us to identify taxa of plastic-degrading microbes. We also aim to include **transcriptomics** data to identify up-regulated genes, and to establish **enrichment cultures** from the landfill leachate, in the laboratory.

Experimental Design

- 1) Sampling and optimization of DNA and RNA extraction (~4 weeks)
- 2) Enrichment cultures under varying conditions (~8-12 weeks)
- 3) DNA and RNA extraction of selected enrichments (1 week)
- 4) Sequence data QC and bioinformatic analysis (~8-12 weeks)

Note that lab work and data analysis will be conducted in parallel, once step 2, obtaining enrichment cultures, has been started.

Objectives and Methods

- 1) Characterize the microbial community in landfill leachate (DNA extraction, sequencing, metagenomics)
- 2) Infer genes expressed by the landfill community, with a focus on potential plastic degrading genes (DNA extraction, sequencing, metatranscriptomics)
- 3) Inoculate enrichment cultures under different temperatures in minimal media and monitor microbial growth (media preparation, OD measurements, measurements of Biochemical Oxygen Demand (BOD))
- 4) Bioinformatic analysis of metagenomic and metatranscriptomic samples (read QC, assembly, binning, and read mapping, on the command line; gene annotation & metabolic reconstruction)

Earliest starting date is **September 2024**, a start in **February/March 2025** is also possible. Experience in molecular biology (e.g. DNA extractions) are required, knowledge of microbial genomics (e.g. UE Struktur und Funktion) and competency in microbiology wet lab skills (e.g. microbial enrichment, culturing) are strongly recommended. Please inquire by emailing Prof. Chris Rinke.