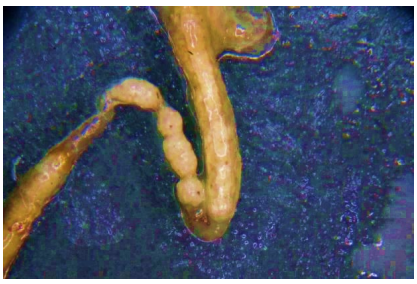
AG Rinke - MultiOmics und Biorecycling (MOB)


Exploring Plastic Degrading Capabilities of Superworm Gut Bacteria

Plastic pollution has become a persistent environmental problem around the globe. High demands for plastic products in combination with poor waste management have led to the accumulation of plastic waste in landfills and the environment, endangering animal and human health and causing irreversible ecological damages. Biodegradation of plastic waste by microbes, many of which are known for their hydrocarbon-degrading abilities, has emerged as a promising solution. The ability of superworms, which are larvae of the darkling beetle *Zophobas morio*, to survive on a sole diet of polystyrene, provides an exciting opportunity to study plastic biodegradation.

The overall goal of the study is to detect potential plastic degrading enzymes used by bacterial consortia in the superworm gut. Particular aims are the following: 1) to enrich microbial gut communities from polystyrene fed superworms, 2) to characterise these enrichments applying metagenomics and metatranscriptomics focusing on genes encoding potential plastic degrading enzymes, and 3) to isolate potential plastic degrading bacterial strains from these enrichment cultures.

Experimental Design

1) Insect rearing with control groups (~4 weeks)
2) Enrichment cultures under varying conditions (~8-12 weeks)
3) Sequence data generation and bioinformatic analysis (~8-12 weeks)
4) Isolations of selected bacterial strains

Note that lab work and data analysis are continuous once step 2, obtaining enrichment cultures, has been started.

Objectives and Methods

1) Rear superworms on a polystyrene and bran diet with a starvation control (insect larvae rearing)
2) Extract superworm gut microbes and prepare enrichment inoculates (dissections, sterile workflow)
3) Inoculate enrichment cultures under different temperatures in minimal media and monitor microbial growth (media preparation, OD measurements, measurements of Biochemical Oxygen Demand (BOD) with OxiTop)
4) Extract DNA and RNA from active enrichment cultures and submit for shotgun sequencing (DNA and RNA extractions, protocol optimisation)
5) Bioinformatic analysis of metagenomic and metatranscriptomic samples (read QC, assembly, binning, and read mapping on the command line)
6) Plating of enrichment cultures and subsequent isolations of selected bacterial strains (plating methods)

Earliest starting date is **September 2024**. Experience in molecular biology (e.g. DNA, RNA extractions) and microbiology wet lab skills (e.g. microbial enrichment, culturing) are required and knowledge of microbial genomics (e.g. UE Struktur und Funktion) is preferred. Please inquire by emailing Prof. Chris Rinke.