

Project Title: Transcriptional regulation of sulfur-based microbial energy metabolism

Supervisor: PD Dr. Christiane Dahl

Institute/group: Institute for Microbiology and Biotechnology, RG Dahl

Webpage: <https://www.ifmb.uni-bonn.de/en/research/rg-dahl/research-focus>

Requirements: Interest in molecular biology, genetics, biochemistry and microbial physiology

Skills to be learned: Analysis of protein-DNA and protein:protein interactions, RT-qPCR, analysis of RNA-Seq data, genetics with a non-model organism including development and application of CRISP-Cas, anaerobic techniques

Project Description (max. 150 words): The group's research focus is sulfur-based microbial energy metabolism. Many bacteria are not strictly limited to this type of energy conservation but can adapt metabolic flux to environmental conditions by transcriptional regulation. However, signal transduction and DNA-binding regulatory proteins are poorly understood. Our model organism, *Hyphomicrobium denitrificans*, contains two related homodimeric repressor proteins, which closely interact to regulate the expression of sulfur oxidation genes. We want to elucidate in detail the mechanisms underlying this regulation. We apply all modern techniques relevant in the field, including electrophoretic mobility shift assays, Rt-qPCR, RNA-Seq or Biolayer Interferometry. Protein analysis in the absence of oxygen is often necessary, requiring work in an anaerobic tent. Our model bacterium is genetically tractable and the genetic toolbox is constantly being expanded. This includes the use and development of a specially designed CRISPR-Cas system. The student will be trained in all necessary techniques.

Support concept (max. 75 words): Working hours are flexible and can be adapted to the individual study program. The exact project will be tailored to the student's interests. Close guidance by doctoral students and the group leader is guaranteed. Tight integration into the group is further strengthened through active participation in the weekly group seminar. The project can be deepened in lab rotations and a Master thesis. Attending conferences, presenting papers, and co-authoring publications will be encouraged and supported.