

Differential Cultivation Elicits Microbial Chemical Diversity

Supervisor	Ass.-Prof. Mitja M. Zdouc, Division of Pharmacognosy
Topic	Microbiology, Molecular Biology
Duration	6 Months (full-time), wet-lab only
Requirements	Bachelor in Pharmacy, Biology, or similar
Language	English/German

Description

Soil microbiomes are a treasure trove of **chemical diversity**. In bacteria, it is estimated that **only 3%** of these so-called **natural products** (NPs) have yet been experimentally characterized, providing a rich source for drug discoveries [1]. However, many bacterial NPs are not produced under standard laboratory conditions, with the corresponding biosynthetic gene clusters being “silent”. Yet, by adjusting culture conditions, NP production can be **elicited**, an approach known as **OSMAC** [2]. Such **differential cultivation** can lead to the discovery of new chemistry and biological activities.

In this project, you will start with a batch of existing **bacterial isolates**, selected from our in-house strain library. Your initial focus will be cultivation of strains in a **single condition** to verify culture purity, perform bioactivity testing, and identification by **16S rRNA-DNA sequencing**. Once this baseline is established, you will expand your cultivation efforts, for instance by performing **media screens** or **co-cultivation experiments**. The cultivation work will be followed by **extraction** and **bioactivity testing**. You will also learn how to **document** your results, compare strains to **publicly available data**, and build **phylogenetic trees**. This work will build towards consecutive comparative metabolomics analysis, with the potential to lead to new antimicrobial therapies.



Learning outcomes

At the end of this Master thesis, you will be able to:

- **Perform** cultivation, extraction, and growth inhibition testing of bacterial strains.
- **Determine** the identity of bacteria by 16S sequencing, **performing** PCR and quality control.
- **Interpret** results, summarize findings, and **document** your work using FAIR data principles [3].
- **Present** findings in word and text and **understand** the manuscript writing process.

How to apply

Please contact Ass.-Prof. Mitja Zdouc via E-Mail (mitja.zdouc@univie.ac.at), indicating the progress of your studies, your preferred starting date, and if you fulfill the requirement criteria. Please include a brief statement about your research interest, why you would like to work on this project, any prior knowledge related to the topic, as well as preferred working style and supervision expectations. Applicants will be invited for a brief interview where the project will be discussed in detail.

References:

- 1 Gavriilidou et al. 2021 Nat Microbiol DOI: [10.1038/s41564-022-01110-2](https://doi.org/10.1038/s41564-022-01110-2)
- 2 Bode et al. 2002 ChemBioChem DOI: [10.1002/1439-7633\(20020703\)3:7%3C619::AID-CBIC619%3E3.0.CO;2-9](https://doi.org/10.1002/1439-7633(20020703)3:7%3C619::AID-CBIC619%3E3.0.CO;2-9)
- 3 https://en.wikipedia.org/wiki/FAIR_data