technische universität dortmund

Fakultät Bio- und Chemieingenieurwesen
Lehrstuhl Technische Biochemie
Prof Dr. Oliver Kayser

# Master's Thesis: Genomics in heterologously-transformed Cannabinoid-producing *Saccharomyces cerevisiae*

About the project: In recent decades, research and pharmacological-use of *Cannabis sativa* has exploded in popularity due to relaxation of prohibition in many countries around the world. This has created a global demand for cannabinoids and resulted in the development of a lucrative global industry. Traditional cultivation of cannabis has proved to be problematic at industrial scale for many reasons. Such problems have destabilized the cannabis market. The cannabis industry could therefore benefit from having an instantaneous-system of cannabinoid production that can be done with a scalable and inexpensive process such as fermentation by microorganisms. The chair of Technical Biochemistry researches, designs and engineers cannabinoid biosynthesis-processes in heterologous-strains of *Saccharomyces cerevisiae*. This research will optimize cannabinoid-bioproduction by characterizing the impact of genetic engineering on transcriptional- and metabolic- regulation.

Proposed methods: This work will involve wet- and dry-bench methods using an Oxford Nanopore MinION Mk1C to sequence the genome and the transcriptome of *S. cerevisiae.* While opportunities for transcriptomics and metabolomics are available, this research will primarily focus on genomic acquisition, assembly and alignment. Wet bench methods include cell cultivation, DNA extraction, targeted-PCR and q-RT-PCR, and Oxford Nanopore sequencing. The student will then help to assemble the genome, identify homologs and annotate genes, and compile transcriptomic data. The student should be prepared to research their own methods as appropriate and collaborate with their supervisor on method implementation. The student will work in tandem with the supervisor for data analysis and work independently using the Oxford Nanopore Galaxy cloud computational tool.

Qualifications: A successful student will have a strong background in practical microbiology (aseptic technique, media preparation) and good working-knowledge of cellular and molecular biology. The student should be technologically literate and have aptitude for data-science/bioinformatic analysis. Supervision will be provided 100% in English and the thesis must be drafted in English. Strong communication skills are compulsory.

Career: Cell-based systems engineering is not only for those interested in the cannabis industry. Outside of the cannabis-space, pharmaceutical and chemical companies are increasingly investing in biologics-portfolio development for drugs, polymers, agro-chemicals, and biofuels. The project will be of-interest to those who want to pursue a career in biotech, ag-tech, biochemistry, molecular biology, genetics, bioinformatics, or fermentation sciences. Next generation sequencing (NGS) such as Oxford Nanopore and bioinformatics are highly marketable skills and will be beneficial for an academic career for researchers interested in non-model organisms, microbiomics, virology, or other research fields which rely on sequencing.

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Applicants are encouraged to send a letter of motivation including a short description of their background and qualifications. Please contact Ms. Jordan with further questions.