

Single-cell analysis of the growth behavior of *C. glutamicum* as a function of temperature

About Us: The “Microsystems in Bioprocess Engineering” group is situated within the Chemical Engineering (CIW) Faculty of the KIT. Our goal is to bridge the gap between microfluidic technologies and bioprocess development. We develop novel microfluidic tools (e.g., single-cell cultivation systems) and apply them to investigate research questions relevant to bioprocessing. Utilizing the acquired knowledge, our aim is to pioneer the development and establishment of new bioprocesses. Our work is conducted in a highly interdisciplinary manner, involving collaboration with experts in e.g. microbiology, physics, material and data science.

Background: Microfluidic single-cell cultivation (MSCC) has become a potent instrument for exploring cellular heterogeneity and adaptive behavior to diverse environmental perturbations. The precision in regulating environmental parameters and close monitoring of individual cells with high spatio-temporal resolution is pivotal for comprehending the complexities of cellular behavior. The knowledge derived from MSCC exhibits considerable promise for application in bioprocess engineering, with the potential to understand and optimize existing processes and foster the development of novel bioprocesses.

Project Aim: This master’s project aims to systematically investigate the impact of different cultivation temperatures on the single-cell growth behavior of *Corynebacterium glutamicum*. To achieve this, advanced microfluidic cultivation systems, in conjunction with live-cell imaging technology, will be utilized to perform MSCC and systematically analyze the growth behavior at the single-cell level. Based on the obtained results, the impact of different preculture temperatures and temperature adaptation will be further assessed in combination with MSCC.

Your Tasks:

- Fabrication of microfluidic single-cell cultivation devices
- Microfluidic single-cell cultivations experiments
- Testing of different automated analysis frameworks
- Analysis, evaluation and interpretation of single-cell imaging data
- Establishment of preculture protocols

Your Qualifications:

- Background in bioengineering, biotechnology or similar
- Knowledge of microbiological methods
- Interest in multidisciplinary research
- Good written and spoken English skills
- Structured, independent and meticulous working method

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