Metabolic engineering of non-conventional yeasts

Summary

The transition towards a bioeconomy requires novel processes for the chemical, and material, but also for food production that uses sustainable substrates, has improved life cycle assessments and, hence, requires less energy to produce. Non-conventional yeasts provide an opportunity to develop efficient cell factories, however, the efficiency of their metabolic engineering must be increased. The current PhD position will focus on developing efficient synthetic biology tools for efficient engineering of non-conventional yeasts and exemplify those tools by demonstrating increased production of anti-oxidants and oleo-chemicals.

Research field:	Chemistry and biotechnology
Supervisors:	Prof. Dr. Petri-Jaan Lahtvee Dr. Nemailla Bonturi
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between October 01, 2022 00:00 and October 23, 2022 23:59 (Europe/Zurich)

Description

Background

The yeast *Rhodotorula toruloides* has recently been defined as a high-potential workhorse for biotechnological applications. This yeast can grow in various substrates, including non-detoxified lignocellulosic hydrolysates, accumulating over 70% of its dry biomass in lipids, and growing to high cell densities. *R. toruloides* is also a natural producer of industrially relevant and high-value compounds, such as carotenoids, L-phenylalanine ammonia-lyase and D-amino acid oxidase. The ability to produce lipids and high-value co-products, such as carotenoids, from low-cost substrates is imperative for the economic viability of oleochemicals production. In our previous research, we sequenced the *R. toruloides* strain, developed metabolic engineering tools, and developed a systems biology platform with a genome-scale model and omics data analysis pipelines.

The research

In the current project, we aim to engineer this promising non-conventional yeast to accumulate and excrete high levels of oleochemicals and optimize their metabolism to regenerate limiting redox factors as well as to reduce the excretion of the main byproduct – CO_2.

The main tasks of the project include (I) developing of new metabolic engineering tools; (ii) demonstrating the efficiency of the tools by engineering oleo-chemical and antioxidant production: (iii) analysing techno-economics and life cycle assessment of the developed biotech processes.

Applicants should fulfil the following requirements:

- a master's degree in microbiology, biotechnology or other relevant discipline
- a clear interest in the topic of the position
- excellent command of English
- strong and demonstrable writing and analytical skills
- capacity to work both as an independent researcher and as part of an international team
- capacity and willingness to provide assistance in organizational tasks relevant to the project

The following experience is beneficial:

- Cultivation of yeast
- Programming in Python
- Metabolic engineering of yeast or bacterium
- Working knowledge of statistics
- Working with liquid chromatography

The candidate should submit a research plan for the topic, including the overall research strategy. The candidate can expand on the listed research questions and tasks and propose theoretical lenses to be used.

We offer:

- 4-year PhD position in a multi-disciplinary research group in the field of bioengineering
- Opportunities for conference visits, research stays and networking with globally leading universities and research centers in the fields of synthetic biology, biotechnology and bioinformatics
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Additional information

For further information, please contact Prof Petri-Jaan Lahtvee lahtvee@taltech.ee or visit https://bioeng.taltech.ee/.

To get more information or to apply online, visit https://taltech.glowbase.com/positions/601 or scan the the code on the left with your smartphone.