Role of peptides as yeast nitrogen source and their effect on quality of fermented foods

Summary

The current doctoral thesis aims at elucidating the roles of peptides in yeast nitrogen nutrition, the mechanisms underlying their assimilation under various fermentation conditions, as well as studying their effect on quality attributes of fermented foods.

Research field:	Chemistry and biotechnology
Supervisors:	Ildar Nisamedtinov Toomas Paalme
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich)

Description

Adequate supply of assimilable nitrogen is one of the key factors in ensuring rapid and complete fermentation of sugars by yeasts. In spite of the fact that almost all natural feedstocks used in (food) fermentations contain peptides, the latter are usually overlooked as the source of nitrogen for yeast. The major reasons for this are the lack of knowledge on rate of peptides assimilation depending on their properties (size, AA sequence, charge, hydrophobicity etc.) as well as the complexity of methods allowing for quantitative analysis of peptides in food matrices. Also, in spite of number of peptides transporters identified in yeast it is still unclear how they are regulated in response to environmental conditions that occur in different food fermentations. One particular factor to be studied is the effect of nitrogen catabolite repression (NRC) of peptide transporters expression, caused by glutamic acid, arginine and ammonia in common fermentation media. The effect of peptides on sensory attributes of fermented foods will also be studied by assessment of their effect on expression of genes encoding enzymes for synthesis or release of flavor active compounds (estres, higher alcohols, volatile thiols). Also, the effect of unabsorbed peptides in food matrix, including the ones cleaved from food proteins by exogenous peptidases of non-Saccharomyces yeast species increasingly used in food fermentations will be studied.

Responsibilities and tasks

The PhD student will be responsible for planning and conducting all the necessary research activities related to the current thesis, leading to publication of minimum three papers in peer-reviewed journals by the end of the 4th year of nominal studies time after matriculation. Specifically, the experimental tasks include conducting yeast fermentations, peptide identification and quantification, metabolome analysis, yeast genetic engineering.

Qualifications:

- Microbiology or biotechnology or molecular biology or biophysics
- Skills in advanced instrumental analysis are recommended

The applicants should fulfill the following requirements:

- microbial fermentations (batch, continuous
- gene expression analyses (targeted as well as genome wide)
- yeast genetics (construction of deletion/overexpressing mutants)
- instrumental analysis (metabolomics)

- fluent in spoken and written English

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