Independent Projects in Food Science, 30 hp (A1E or A2E – Magister or Master)

NB! A1E can be written in Swedish or English, A2E must be written in English.

If you are interested in any of the suggested projects or just want more information please contact the supervisor. For some projects see more details below.

Impact factors controlling the desired raw milk quality, mainly for the production of cheese and milk powder
Contact: Maria.A.Karlsson@lrf.se Tel. 010-1844418

Nutritional density in relation to environmental impact - how do we best evaluate food from a health and environmental perspective?
Contact: Ann-Kristin.Sundin@lrf.se Tel. 010-1844185

Dairy matrix - milk and dairy products beyond saturated fatty acids
Contact: Ann-Kristin.Sundin@lrf.se Tel. 010-1844185

Lactose in cheese – are levels of concern?
Contact: Maria.Karlsson@lrf.se; Ase.Lundh@slu.se

Feeding strategies to reduce methane emission from dairy cows; effect on protein and fat profiles in milk
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

Development of cheese microbiota during maturation of artisanal cheeses
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

Comparison of the composition, protein profile and technological properties of milk from Swedish Mountain cows and Swedish Holstein cows.
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

How is FFA levels in milk affected by lactation number of the cow?
Contact: Monika.Johansson@slu.se; Ase.Lundh@slu.se

Dietary fiber, starch and phenolic profile of Swedish pea fractionates obtained from Pea Biorefinery process
Contact: Roger.Andersson@slu.se Santanu.Basu@slu.se

Pulse milling and Sieving: Functionality of the different fractions
Contact: Santanu.Basu@slu.se Roger.Andersson@slu.se

Pea Flour / Starch Functionality
Contact: Santanu.Basu@slu.se Roger.Andersson@slu.se

Grain morphology profiling with the novel Cgrain instrument. Comparison between wheat landraces and modern cultivars at different cultivation conditions. (www.slu.se/brodprojekt)
Contact: Roger.Andersson@slu.se

Vill du hjälpa Åland att utveckla en hållbar livsmedelsstrategi? Eller vill du vara en del av Ålands mathantverk?
Kontakt: Harriet Strandvik,verksamhetschef, Mathantverkare på Åland rf;
harriet@mathantverkare.ax; monika.johansson@slu.se

Investigating exopolysaccharides (EPS) formation und composition in oleaginous red yeasts.
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Microbial lipid and carotenoid production from logging residues
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Extraction and analysis of extracellular substances in oleaginous red yeasts – identifying novel compounds for industrial applications
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Light dependency of carotenoid production in oleaginous red yeasts
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Genetic manipulation of oleaginous red yeasts using CRISPR/Cas
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Characterisation of microbial consortia during combucha-brewing
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

Stability of pasteurised and non-pasteurised combucha
Contact: Volkmar Passoth Volkmar.Passoth@slu.se

For detailed information please contact: Volkmar Passoth (Volkmar.Passoth@slu.se).

Making Tofu products using Swedish grain legumes
Contact: Jing.lu@slu.se; anja.herneke@slu.se

The consumer's dilemma – food safety vs food waste

Contact: Karin Söderqvist, Karin.soderqvist@slu.se (Department of Biomedical Sciences and Veterinary Public Health, SLU) and Marie Lange, marie.lange@ikv.uu.se (Department of Food Studies, Nutrition and Dietetics, Uppsala University)

Är vegetariska smörgåspålägg riskprodukter för Listeriainfektion? En tillväxtstudie av Listeria monocytogenes i ätfärdiga vegetariska livsmedel. [Are vegetarian sandwich toppings risk products for Listeria infection? A growth study of Listeria monocytogenes in ready-to-eat vegetarian foods.]

Contact: Karin Söderqvist Karin.soderqvist@slu.se (Department of Biomedical Sciences and Veterinary Public Health, SLU)

PROJECT DESCRIPTIONS

Impact factors controlling the desired raw milk, mainly for the production of cheese and milk powder
How is the milk raw material affected by the various factors in the value chain? Especially genetic markers for milk quality. Problematization about the total number of bacteria is also relevant.

Investigating exopolysaccharides (EPS) formation und composition in oleaginous red yeasts

EPS are used as viscosity agents (thickeners) and emulsifiers in food industry, in medical application for coating of medical devices and for waste water treatment as they adsorb heavy metal ions and aromatic compound. In this project you are going to study the formation of EPS in different *Rhodotorula toruloides* strains and analyze their chemical nature.

Microbial lipid and carotenoid production from logging residues
Oleaginous red yeasts may accumulate lipids to levels exceeding 70 % of their cell dry weight and are strong carotenoid producers. These lipids can sustainably replace vegetable oils in food and feed. Carotenoids are used as nutritional supplements, dye in dietary supplements, pharmaceuticals and cosmetic industries. The use of logging residues from forest industry as a substrate to produce lipids and carotenoids can add an additional value to Swedish key industries and decrease the dependency for importing unsustainably produced vegetable. In this project you are going to analyse the lipid content and carotenoid composition from different *Rhodotorula toruloides* strains growing on logging residues.

Extraction and analysis of extracellular substances in oleaginous red yeasts – identifying novel compounds for industrial applications

The composition of the extracellular substances secreted by oleaginous red yeasts has been poorly understood. Examples of known substances are various exopolysaccharides, which are used in food industry as e.g. viscosity agents (thickeners) and emulsifiers. However, there are still a lot of unknown substances secreted by red yeasts. Among these substances many may be of relevance for food industries or other industrial sectors. In this project you examine the composition of the supernatants for the presents of extracellular substances from different red yeasts.

Light dependency of carotenoid production in oleaginous red yeasts

Oleaginous red yeasts are strong lipid and carotenoid producers. The latter is used as nutritional supplements, dye in dietary supplements, pharmaceuticals and cosmetic industries. For the successful commercial production of carotenoids from red yeast, the carotenoid content should be as high as possible, and quantitatively reliable. Carotenoids are produced by cells in response to oxidative stress. In this study you will investigate the impact of light on the carotenoid content of the cells.

Genetic manipulation of oleaginous red yeasts using CRISPR/Cas

The oleaginous red yeasts *Rhodotorula toruloides* is a strong lipid and carotenoid producer and a workhorse for biotechnology applications as it can be metabolically engineered to produce compounds not naturally produced by this yeast. In order to alter yeast performance and lipids towards the production of food/supplements, animal feed and oleochemicals of industrial relevance genetic modifications are needed. One of the recent genetic techniques that is breaking new ground for metabolic manipulation is CRISPR/Cas, a genome editing technology used to edit DNA at precisely defined sites. Alternatively, we are going to develop knock-down of genes using anti-sense technology, which is easier to obtain, since it is based on a system that is naturally present in this yeast.

In this project you will further develop the application of CRISPR/Cas for the genetic manipulation of *Rhodotorula* strains. This requires a basic understanding of genetics and molecular techniques.

Characterisation of microbial consortia during combucha-brewing

This project will be done in collaboration with Källsjö Bryggeri. This company is producing high-value combucha with a character that reminds to Champaign. There is, nevertheless, some fluctuation in the quality, which is probably to a large part due to changes in the microbial consortium. This project aims to monitor the microbial population during fermentation. Methods to be used will include culturing of microbes and their identification with molecular techniques.

Stability of pasteurised and non-pasteurised combucha

This project will be done in collaboration with Källsjö Bryggeri. This company is producing high-value combucha with a character that reminds to Champaign. Currently, the company is pasteurising their product to ensure its stability until consumed. However, heat treatment affects the final taste, therefore it needs to be tested, whether one can store the product without pasteurising or with less intense pasteurisation. Different badges of combucha will be stored for varying times and at different temperatures, and the hygiene (microbial populations) will be tested. Methods to be used will include culturing of microbes and their identification with molecular techniques.

Making Tofu products using Swedish grain legumes

Background

Local protein-rich grain legumes are an attractive option, e.g. faba beans and yellow peas have high levels of protein, starch and soluble fibre, but are under-utilised in human diets in Sweden. If texture can be improved and anti-nutrients reduced in target legume-based foods, demand for local legumes suitable for large-/small-scale cultivation in Sweden will increase.

Project goals

1. Optimize Swedish legumes (e.g. faba bean, yellow pea, lentil) for making tofu
2. Characterize texture attributes and rheological characteristics

Faba beans, yellow peas and lentils from Sweden will be used, taking organic French soybeans used in commercial tofu production by YiPin as reference. Process efficiency will be evaluated as tofu yield. Protein microstructure will be characterized by microscopy (LM, CLSM), texture (hardness, elasticity, adhesiveness) with a texture profile analyser, viscoelastic properties with a rheometer, and colour using a colorimeter CR30-16 (L*a*b system). 2. Total protein content (N x 6.25) will be determined by the Kjeldahl method and amino acid composition (AA) with an AA analyser. Fatty acid components, which affect tofu hardness and indirectly the edible and nutritional value, will be measured by gas chromatography (GC). Relations between chemical traits and sensory quality attributes of tofu will be evaluated by cluster analysis.

The consumer's dilemma – food safety vs food waste

Background:

Reducing food waste is of great importance for a sustainable development and one target of 2030 Agenda (Nr: 12.3) is to reduce food waste by 50%. The private households are responsible for the largest part of the Swedish food waste and it has been reported that more than half of the food that has been discarded at consumption level is edible at the time of wasting. This may be a

consequence of that the discussion about food safety has a much longer history than the discussion about food waste. However, some food products may actually become health hazards if consumed after its use by date, e.g. smoked salmon or ham. This mainly poses a risk for the elderly, pregnant women and the immunocompromised. But in today's discussions, the debate about reduced food waste (and also economic interests) often ends up higher on the agenda than the one about food safety. This result in a struggle between the perspectives as you do not want to throw away food and at the same time you want to eat safe food.

Project:

The purpose of the project is to study consumers knowledge, routines, and attitudes towards food handling in the private household with a focus on food safety. What conflict of interest could be found between food waste and food safety actions? Which factors could impact consumer wastage? How is the relation between food safety and the aim for less food waste discussed among food retailers? In this project, qualitative data will be combined with quantitative data as it is planned to include interviews followed by a consumer survey.

Är vegetariska smörgåspålägg riskprodukter för Listeriainfektion? En tillväxtstudie av Listeria monocytogenes i ätfärdiga vegetariska Livsmedel [can be written in English]

Listeria monocytogenes kan orsaka allvarlig sjukdom och dödsfall hos personer med nedsatt immunförsvar, äldre och gravida. Bakterien finns i miljön och kan få fäste i lokaler och utrustning där livsmedel tillverkas, vilket medför en risk att bakterien kontaminerar livsmedel. Detta är ett problem för livsmedel som är färdiga att konsumera utan föregående tillagning, t ex kallrökt lax och smörgåspålägg som skinka, eftersom *L. monocytogenes* kan växa i kylskåpstemperatur och riskerar att nå skadliga nivåer under hållbarhetstiden. Under senare år har det dykt upp allt fler ätfärdiga produkter som inte innehåller animaliska råvaror, såsom ”vegoskivor” och ett brett utbud av vegetariska korvar. Det finns ännu få studier som undersökt möjligheten för *L. monocytogenes* att växa i dessa produkter vilket gör denna fråga viktig och intressant för att utvärdera om de kan anses vara riskprodukter för listeriainfektion eller inte.

Syfte

Att undersöka om vanliga ätfärdiga produkter som tagits fram som substitut till t. ex. skinka och korv innebär en risk för listeriainfektion.

Metod

En tillväxtstudie kommer att genomföras där *L. monocytogenes* inokuleras i några olika ätfärdiga vego-produkter för att simulera en kontamination. Därefter analyseras prover under förvaring av produkter i väl fungerande kylskåp respektive ett kylskåp som håller en för hög temperatur. Av analyserna kan man sedan dra slutsatsen om livsmedlet gynnar tillväxten av *L. monocytogenes* eller inte, vilket kopplas till risken för konsumenten att insjukna i listeriainfektion.