Food area

MASTER

THESIS

Projects

The Master’s degree programme in Department of Food Science
Table of content

1. Fishomics - effect of feed on the fish metabolome
2. Metabolomics studies of nature’s perfect food: milk
3. Purification and analysis of oligosaccharides from human milk
4. Effect of beneficial milk-derived carbohydrates on bacterial growth in an in vitro set-up
5. NMR metabolomics techniques to elucidate dietary responses
6. Fiber-enrichment of meat sausages
7. Effect of high fat diet on hepatic metabolism
8. Cell model simulation of food ingredients intake
9. Molecular changes in muscle structures with consequences for meat quality
10. Enhancing potato protein for human consumption
11. Proteomics and peptidomics applications of protein based foods
12. Crystallisation and microstructure of edible fats
13. Bioavailability of proteins from green plants - a peptidomic study
14. Screening for Antioxidative Compounds from the Annatto plant
15. Stabilization of natural colours from the Annatto plant
16. Bioavailability of proteins - a peptidomic study
17. Protein co-precipitation between plant and animal proteins
18. Milk protein may stabilize carotenoids
19. Fat globule membrane and milk proteins, stabilizing effect of vitamin D
20. Application of sensory crossmodal research to increase enjoyment of food in restaurant settings

21. Sweet product development - taste-taste and crossmodal modulation of the sensory perception of beverages

22. The electronic tongue - how does it work and can it replace a sensory panel?

23. Acceptance of organic, bitter and healthy vegetables in the public food service sector and among consumer

24. Optimization of low protein imitation cheese

25. Play and Eat - Health in schools

26. Influence of different product and sensory profiling methodology factors on the perceived bitterness of beer

27. Optimizing the method for measuring the satiating capacity of foods

28. A healthy feeling - what sensations are created as a consequence of healthy eating?

29. Relationship between volatile organic compounds and postharvest quality changes of leafy green vegetables

30. Testing a future vegetable

31. Investigating healthy compounds in green leafy vegetables of white flowering rapeseed

32. Discover the surface/foaming properties of whey protein
Fishomics - effect of feed on the fish metabolome

SHORT PROJECT DESCRIPTION

Metabolomics represents a holistic and untargeted approach that aims at studying the complete set up metabolites present in a biological material, and metabolomics has proven to provide useful information on nutritional aspects of foods. While numerous metabolomics studies exist on human and animals to study dietary effects, metabolomics studies on fish are rare. This is despite the fact that aquaculture is growing substantially, and there is an increasing interest in understanding nutritional aspects of fish feed. The aim of this project is to develop investigate the relation between fish feed composition and quality and the growth performance of the fish from fish feeding trials. NMR-based metabolomics will used to reveal the effect of proteins on the metabolome of the fish tissues and biofluids.
# Metabolomics studies of nature’s perfect food: milk

## SHORT PROJECT DESCRIPTION

Breast milk is the Gold Standard feeding regime for newborn infants and represents a baseline for the functional performance of infant formulae. Breast milk is assumed to be decisive for a healthy microbial colonization of the infant gut. Minor milk peptides from the MFGM have been shown to have a positive effect on specific important bacterial strains. Metabolomics represents a holistic and untargeted approach that aims at studying the complete set up metabolites present in a biological material, and metabolomics has proven to provide useful information on nutritional aspects of foods. The objective of this project is to establish a metabolomics method to measure the breast milk metabolome. In addition, as it remains unknown how colonization of the infant gut is affected by the breast milk composition, the project will focus on elucidating how mother’s breast milk metabolites can modulate the microbiota in the infant’s gut.

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<th>MAIN SUBJECT AREA</th>
<th>Metabolomics, nutrition</th>
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<th>ADDITIONAL INFORMATION</th>
<th>Co-supervisor, post doc. Ulrik Sundekilde. E-mail: <a href="mailto:uksundekilde@food.au.dk">uksundekilde@food.au.dk</a></th>
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<td>The project is part of a larger platform study with collaborators from University College Cork, Ireland. The objective of this platform study is to define the composition and functional performance of breast milk, over time, using state-of-the-art analytical technology including Next-gen sequencing of the gut microbiota.</td>
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**MAIN SUPERVISOR**

Professor Hanne C. Bertram  
Department of Food Science  
Aarhus University  
E-mail: hannec.bertram@food.au.dk  
Phone: +45 87158353  
Homepage: http://food.au.dk/
Purification and analysis of oligosaccharides from human milk

SHORT PROJECT DESCRIPTION

Human milk is regarded as the perfect food for infants containing all necessary vitamins, minerals and nutrients for growth and development of a small child. Some components of human milk however, are not digested or absorbed in the upper gastrointestinal tract, but act as food for the bacteria that are found in the gut microbiota. These are so-called prebiotics. More specifically, oligosaccharides in human milk appear to stimulate the growth of Bifidobacterium in the infant gut and contribute to the development of the immune system during early life.

There can be many reasons for choosing infant formula as a source of nutrition for the new-born, be it disease of the mother, insufficient milk production or other reasons. In any case, the infant formula should mimic the functions of human milk.

Purification and analysis of oligosaccharides from human milk (HMO) is a crucial step towards understanding the composition of the oligosaccharides. In this master thesis project oligosaccharides will be purified from human milk samples in small scale. An LC-MS method will be set up in order to analyse the composition of HMO. The scalability of the purification process is important to consider.
Effect of beneficial milk-derived carbohydrates on bacterial growth in an in vitro set-up

**SHORT PROJECT DESCRIPTION**

Components of human and bovine milk appear to stimulate the growth of *Bifidobacterium* in the infant gut and contribute to the development of the immune system during early life. Inspired by the study of Ehara et al. (2016), we designed an in vitro experiment involving 7 bacteria representative of both the beneficial and harmful genera of the human infant flora and milk-derived carbohydrates (lactose, GOS or bovine oligosaccharides) as the only source of carbohydrates. We speculate that the bacterial composition will be dependent on the carbohydrate source. qPCR is a gene expression method for amplifying specific DNA sequences. In this master thesis project, we will utilize this technique for the quantification of bacterial cell counts in the in vitro experiment by measuring the number of copies of the 16S gene of each of the bacterial strains in the mixtures. The experimental work (optimization and execution of protocol for qPCR) will take place at Copenhagen University (Dept. Food Science).

References:

NMR metabolomics techniques to elucidate dietary responses

**SHORT PROJECT DESCRIPTION**

Nuclear magnetic resonance (NMR)-based metabolomics is gaining more and more use in research focusing on investigating health-promoting effects of specific diets or food items. Several research studies have applied NMR-based metabolomics analyses on urine samples collected from controlled dietary intervention studies, and through the application of multivariate data analysis (MVDA), differences in the urinary excretion of specific metabolites have been identified. The obtained information can be useful in understanding why some specific foods may have either beneficial or harmful effects on human health. NMR spectroscopy is a popular analytical technique for metabolomics investigations as it offers simple requirements for sample preparation and provides data where metabolite identification is conceivable. However, an NMR spectrum of a complex fluid as urine contains numerous and overlapping signals, which can hamper detection and identification of metabolites. The current project focuses on the application of NMR-based metabolomics on urine samples to study the dietary response. In addition, the project will focus on elucidating the possibilities for optimizing the spectral quality of NMR spectra of urine samples through the introduction of extraction and chromatographic techniques to separate metabolites and thereby obtain signal enhancement.
Fiber-enrichment of meat sausages

**SHORT PROJECT DESCRIPTION**

Consumers’ awareness of the health-promoting effects of dietary fibers is increasing, and meat industry has initiated work on development of meat products enriched with fibers, where fibers also serve as a fat substitute. From a technological point of view, fat replacement is challenging because it typically gives rise to lower sensory acceptance as the fat replacement has consequences for the texture of the meat product, especially during heat treatment, which impacts how the meat product is being perceived. It is therefore relevant to investigate how fat replacement with fibers potentially can be optimized through use of other functional ingredients to ensure heat and color stability. The aim of this project is to develop and test formulas for fiber-enrichment of a frankfurter-like sausage and to investigate how the inclusion of functional ingredients affects functional and sensory properties.
Effect of high fat diet on hepatic metabolism

SHORT PROJECT DESCRIPTION

High fat diet leads to several health related problems, including cardiovascular diseases. An often overlooked problem is its impact on important hepatic metabolic processes. The liver hosts a great number of important processes, including the enzymatic driven process of detoxification of xenobiotics and drugs. We know that several events affect the activity and expression of these enzymes, belonging to the Cytochrome P450 enzymes system. One less unexplored event is the intake of high fat diet. This project will investigate at the molecular level, the impact of high fat diet and specific components of it, on the expression of cytochrome p450 in the liver. The project includes isolation and culturing of primary liver cells, analysis of gene (qPCR) and protein expression (e.g. western blotting).
Cell Model simulation of Food Ingredients intake

SHORT PROJECT DESCRIPTION

Caco-2 is a human colon epithelial cancer cell line. By growing a Caco-2 cell monolayer on permeable membranes in-vitro, the cell model can be used to mimic the epithelial cell layer lining the intestinal wall of the small intestine. Intervention studies can be made by adding a component of interest on the apical side of the Caco-2 cell monolayer. An effect of the intervention can be seen by measuring the Caco-2 cell monolayer integrity and the cell media on the apical and basolateral sides. At the end of the experiment the Caco-2 cells can be harvested and further investigated.

This project will partner DuPont Nutrition & Health. Different food ingredients will be tested on the caco-2 cell monolayer model to study cell permeability and integrity. To gain further mechanistic insight, OMICS-techniques can be used on the metabolic and proteomic levels.

The project aim is to:
1) optimize the caco-2 cell monolayer model for obtaining samples for metabolomics and proteomics investigations
2) study the intervention effect using transepithelial resistance (TEER), fluorescence with a fluorescence dye and qPCR techniques on the expression of genes.
Molecular changes in muscle structures with consequences for meat quality

SHORT PROJECT DESCRIPTION

The etiology of the abnormality if the large breast muscle of chickens, called “wooden breast”, is unknown. The development of wooden breast has been registered already 2 weeks prior to slaughter. The aim of this project is to follow the development of wooden breast from the chickens are small until the time of slaughter and try to identify biomarkers which at an early stage can indicate if wooden breast is developing. The project include gene and protein regulation analysis (real time PCR and western blotting, respectively) as well as assessment of some meat quality aspects (water holding capacity and texture).

PHYSICAL LOCATION OF THE PROJECT
AU-Foulum Blichers Allé 20, DK-8830 Tjele

PROJECT START
August 2017

EXTENT AND TYPE OF PROJECT
60 ECTS M.Sc. project including practical laboratory work, 11 months

MAIN SUBJECT AREA
Meat quality at molecular level

ADDITIONAL INFORMATION
Postdoc Martin Krøyer Rasmussen will be co-supervising

MAIN SUPERVISOR
Senior Scientist Jette Feveile Young
Department of Food Science
Aarhus University
E-mail: jettef.young@food.au.dk
Phone: +45 87158051/23478883
Homepage: http://food.au.dk/
Enhancing potato protein for human consumption

SHORT PROJECT DESCRIPTION

Potato proteins have traditionally been divided into three major groups, namely patatins, protease inhibitors, and high molecular weight proteins. One of the hurdles of exploitation of potato proteins in the food industry is the presence of GA, that are both toxic and bitter tasting, as well as PPO activity, which result in brown coloring and deterioration of the protein quality and appearance. The GA are expected to be removable by different fractionation methods, e.g. hydrophobic interaction, membrane filtrations (ultrafiltration), while PPO may be controlled by inhibitors, pH and ionic conditions etc, and this will be tested. The project involves using different analytical and preparative protein isolation techniques for fractionation of potato fruit water and in spray dried potato protein preparations obtained from industry. This will be coupled with analyses of PPO activity and providing bigger fractions for GA analysis in the bigger project. The project will cover purification and fractionation strategies for separation of potato proteins to get rid of glycoalkaloid (GA) substances as well as exploiting strategies for inhibiting polyphenol oxidase (PPO) in potato protein isolates by various inhibitors. The project will involve protein chemistry-based techniques also, including chromatography and ultrafiltration as well as determination of enzyme activities by assays and activity blotting techniques. The project will possible involve collaboration in setting up a new method for GA quantification by LC-MS.
Proteomics and peptidomics applications of protein based foods

SHORT PROJECT DESCRIPTION

The project will cover application of proteomics and/or peptidomics based methods for the characterisation of protein and/or peptide profiles, respectively, in raw or processed foods by combinations of protein chemistry-based techniques. Possibility to link to technological properties and content and distribution of e.g. minerals. Currently, I supervise master and PhD projects in the areas of UHT milk, milk from native breeds, digestibility of food proteins e.g. after heat treatments, milk oligosaccharides, fractionation and functional properties of proteins from potato and in quality aspects of different dairy products. This includes quality of UHT products, of lactose-reduced UHT milk and overall characterisation of protein composition of different fractions or dairy products prepared from bovine milk, including raw bovine milk. Furthermore, we look at milk quality, protein composition, proteolysis and technological properties in relation to cow genetics, genetic variants of milk proteins, somatic cell count and at prolonged lactation. We also look at e.g. calcium content and how different production parameters, treatments and fractionations influence the distribution of calcium in milk and dairy products. It will be possible to discuss master project ideas broadly in relation to these areas and eventually formulate a specific project within these themes and techniques.

PHYSICAL LOCATION OF THE PROJECT
AU-Foulum Blichers Allé 20, DK-8830 Tjele

PROJECT START
August 2017 or according to agreement

EXTENT AND TYPE OF PROJECT
45 or 60 ECTS master thesis project

MAIN SUBJECT AREA
Food at molecular level coupled with raw material quality and production

ADDITIONAL INFORMATION
Eventual involvement of co-supervisors according to the detailed subject. Eventual collaboration with AU-Aarslev at Funen. Collaborations with post. docs., PhDs and other master or bachelor students at the department

MAIN SUPERVISOR
Professor Lotte Bach Larsen
Department of Food Science
Aarhus University
E-mail: lbl@food.au.dk
Phone: +45 87158049
Homepage: http://food.au.dk/
Crystallisation and microstructure of edible fats

**SHORT PROJECT DESCRIPTION**

There are opportunities for the students with interest in texture of food, microstructure and crystallization mechanisms. Projects deal with either milk fat or fats based on vegetable oil/fats. As fat crystallizes it forms a three-dimensional network that is of great importance for the final texture and mouthfeel of the products. The structure of the fat crystal network will depend on processing, which involves cooling, heating and agitation. It is important that edible fat has an optimized melting profile and good taste release together with a desirable texture. The industry, however, lacks knowledge of how different processing factors affect the final structure and functionality of their products. The research unit is for example pursuing to improve the functionality of fat by applying high intensity ultrasound during crystallization. Making new fat ingredients by use of fractionation techniques is also an option.

**Methods:** Rheological measurements will be conducted with rheometers and texture analyzers. The microstructure can be analyzed by various microscope techniques. DSC and pNMR are used for studying crystallization mechanism.

**MAIN SUPERVISOR**

Associate Professor Lars Wiking
Department of Food Science
Aarhus University
E-mail: lars.wiking@food.au.dk
Phone: +45 87157805
Homepage: http://food.au.dk/

**PHYSICAL LOCATION OF THE PROJECT**

AU-Foulum Blichers Allé 20, DK-8830 Tjele

**PROJECT START**

Any time

**EXTENT AND TYPE OF PROJECT**

45 or 60 ECTS master thesis project

**MAIN SUBJECT AREA**

Food structure/Technology
Bioavailability of proteins from green plants – a peptidomic study

SHORT PROJECT DESCRIPTION

An increasing world population demands increasing amounts of proteins. Proteins of animal origin such as milk proteins are recognized as so called full proteins fulfilling humans’ need for indispensable amino acids. However, as we cannot feed the increasing population with only animal protein there is an increasing demand on more sustainable protein sources. Here plant protein from grasses, clover and lucerne make excellent alternative to animal protein. To evaluate the nutritive value, different plant proteins have been tested in ileum-cannulated pigs to assess the ileal digestibility and assess the digestible indispensable amino acid score (DIAAS).

In the present project freeze dried juice collected from the ileum of pigs fed protein extracted from red clover and ryegrass will be analysed with LC-MS techniques to investigate the small intestinal digestion of the green protein. Database search, in silico digest and in vitro digested proteins will be used to characterize the ileum juice for peptides and undigested protein fragments.

Dedicated interest in protein chemistry, bioavailability and in learning an advanced mass spectrometry technique is a necessity.

MAIN SUPERVISOR

Associate Professor Trine Kastrup Dalsgaard
Department of Food Science
Aarhus University
E-mail: trine.dalsgaard@food.au.dk
Phone: +45 87157998
Homepage: http://food.au.dk/
Screening for Antioxidative Compounds from the Annatto plant

**SHORT PROJECT DESCRIPTION**

The market for natural colors is approx. 700M€ with growth rates in excess of 10% annually. A main market driver is reports on adverse effects of synthetic colors in children. Carotenoids are the preferred pigment group used for yellow and orange shades, representing 60% of the market volume. The annatto crop (Bixa orellana L.), that is endogenous to South America, can contain above 5% carotenoids in the seeds. This is 100-1000 times the concentration normally found in orange carrots, making Bixa orellana a promising production system for such pigments. The major pigments in the annatto plant are cis-bixin (70-80%) and minor constituents are trans-bixin and cis- and trans forms of norbixin. These pigments are used as natural colours in e.g. cheddar cheese. The problem with these pigments is that they bleach upon light exposure and heat treatment. Natural occurring antioxidants can be introduced to reduce the bleaching/degradation of the pigments.

The project will focus on 1) purification of bioactive compounds from the Annatto plant 2) test purified fractions for antioxidative activity 3) finally in collaboration with a PhD student try to stabilize the pigments bixin and norbixin from the Annatto plant by the mean of antioxidants.
Stabilization of natural colours from the Annatto plant

SHORT PROJECT DESCRIPTION

The market for natural colors is approx. 700M€ with growth rates in excess of 10% annually. A main market driver is reports on adverse effects of synthetic colours in children. Carotenoids are the preferred pigment group used for yellow and orange shades, representing 60% of the market volume. The annatto crop (Bixa orellana L.), that is endogenous to South America, can contain above 5% carotenoids in the seeds. This is 100-1000 times the concentration normally found in orange carrots, making Bixa orellana a promising production system for such pigments. The major pigments in the annatto plant are cis-bixin (70-80%) and minor constituents are trans-bixin and cis- and trans forms of norbixin. These pigments are used as natural colours in e.g. cheddar cheese and beverage. The problem with these pigments is that they bleach upon light exposure and heat treatment.

The project will focus on 1) stabilization of natural colours bixin and norbixin from the Annatto plant in emulsion or by enzyme catalysed derivatization.

MAIN SUPERVISOR
Associate Professor Trine Kastrup Dalsgaard
Department of Food Science
Aarhus University
E-mail: trine.dalsgaard@food.au.dk
Phone: +45 87157998
Homepage: http://food.au.dk/
Bioavailability of proteins – a peptidomic study

SHORT PROJECT DESCRIPTION

An increasing world population demands increasing amounts of proteins. Proteins of animal origin such as milk proteins are recognized as so called full proteins fulfilling humans’ need for indispensable amino acids. Milk has two difference fraction of proteins, the casein and the whey proteins. Caseins are coagulation proteins, which are taken up slowly in the intestine whereas whey is quickly taken up. The two types of proteins has be tested in ileum-cannulated pigs to assess the digestible indispensable amino acid score (DIAAS) according to the recommendations given by the FAO Expert Consultation.

In the present project pigs juice from ilium from pigs fed casein and whey will be analysed with LC-MS techniques to investigate the digestibility and uptake in the small intestine. Database search, in silico digest and in vitro digested proteins will be used to characterize the ilium juice for peptides and no-digested protein fragments.
SHORT PROJECT DESCRIPTION

An increasing world population demands increasing amounts of proteins. Proteins of animal origin such as milk proteins are recognized as so-called full proteins fulfilling humans’ need for indispensable amino acids. Expensive proteins like milk proteins could be complemented partly by plant proteins and still fulfil the need for indispensable amino acids, and thereby help to fulfil the needs of proteins to feed the world. Most recently, we saw very interesting results with respect to co-precipitation and improved enzymatic digestibility, which we will like to investigate more in detail. It might be due to changes in protein structure or to interaction with anti-nutritional factors (ANFs), which is known to reduce the bioavailability of the proteins. Co-precipitation of plant proteins with animal protein is a novel technology applied to remove ANFs from plant proteins and improve functional properties. It will improve bioavailability of the plant proteins, making them candidates as proteins for human consumption.

The project aims at using a co-precipitation of plant proteins with milk proteins to obtain high-quality protein blends. We will investigate the protein-protein interaction and changes in functional properties. Protein quality will be characterized according enzymatic digestibility.
Milk protein may stabilize carotenoids

**SHORT PROJECT DESCRIPTION**

The annatto crop (Bixa orellana L.), that is endogenous to South America, can contain above 5% carotenoids in the seeds. This is 100-1000 times the concentration normally found in orange carrots, making Bixa orellana a promising production system for such pigments. The major pigments in the annatto plant are cis-bixin (70-80%) and minor constituents are trans-bixin and cis- and trans forms of norbixin. These pigments are used as natural colours in e.g. cheddar cheese and beverage. The problem with these pigments is that they bleach upon light exposure and heat treatment. The project will focus on 1) stabilization of natural colours bixin and norbixin from the Annatto plant with different proteins.
SHORT PROJECT DESCRIPTION

Recently, we saw a stabilizing effect of milk constituents on vitamin D in fortified dairy products. We will like to understand, which constituents are responsible for the increased stability of vitamin D when added to dairy products. The objective is to determine the stabilizing effect of milk fat globule membrane and different milk protein on vitamin D at different pH.

Main tasks:

- Purification of milk fat globe membranes from milk
- Build up model systems to investigate the interaction between vitamin D3 and milk fat globule membrane or milk proteins
- Determination of stabilizing effect of milk fat and protein
Application of sensory crossmodal research to increase enjoyment of food in restaurant settings

SHORT PROJECT DESCRIPTION

A good meal in the optimal settings is highly rewarding and can even be out of this world. There is already a large body of empirical research documenting the effect that our senses have on our perception and enjoyment of food and meals. This is both in terms of intrinsic food product factor effects as well as extrinsic (non-food) factors. Research within this area is highly relevant for the understanding of food enjoyment but even more so for the application in the restaurant sector in the continuing strive for perfection.

In an ongoing project, chefs from a private dining company and a scientist from AU FOOD are collaborating to translate some of the empirical research to fit actual private dining situations in order to increase the already high quality meal experiences of the guests. This collaboration is facilitated in many ways. Among others, studies will be performed at FOOD FESTIVAL in Århus to document the effect crossmodal research can have in increasing the enjoyment of meals in restaurant settings. As a master thesis student on this project you will be part of planning, executing and analyzing data from studies from this project in strong collaboration with the chefs.

What is crossmodal perception?
How information from the different sensory modalities such as sight, sound, touch, smell, and taste, may be integrated by the nervous system and perceived by us. Of importance in this thesis is how different sensory modalities interact with one another and alter each other’s processing.

PHYSICAL LOCATION OF THE PROJECT
AU-Aarslev, Kirstinebjergvej 10, DK-5792 Aarslev

PROJECT START
Any time, preferably starting summer 2017

EXTENT AND TYPE OF PROJECT
45 or 60 ECTS master thesis project

MAIN SUBJECT AREA
Sensory and consumer science, gastrophysics

ADDITIONAL INFORMATION
Co-supervisor Doc Line Holler Mielby, LineH.Mielby@food.au.dk

MAIN SUPERVISOR
Professor Derek Victor Byrne
Department of Food Science
Aarhus University
E-mail: derekv.byrne@food.au.dk
Phone: +45 87158394
Homepage: http://food.au.dk/
Sweet product development – taste-taste and crossmodal modulation of the sensory perception of beverages

SHORT PROJECT DESCRIPTION

The sugar intake especially from beverages is too high among specific segments, e.g. adolescents. The beverage industry has mainly focused on reducing sugar content per se with limited success due to drastic alteration in the sensory profile that are disliked by many. The goal of the project Innosweet is to apply an integrated scientific-based sensory perceptual-, psychological-, and physiological (PPP) approach to sugar-reduced or -replaced (SRR) beverages enabling lowering the sugar content whilst maintaining unaltered sweetness perception.

You will as a master thesis student in the Innosweet project work on product development of beverages with lower sugar contents but unaltered sweetness perception from a sensory and consumer science perspective. This is going to be done and tested using taste-taste interaction and crossmodal interactions such as flavor-taste and texture-taste interactions. The thesis will include sensory descriptive analysis and consumer studies and you will be part of planning, executing and analyzing data from the studies.

What is crossmodal perception?
How information from the different sensory modalities such as sight, sound, touch, smell, and taste, may be integrated by the nervous system and perceived by us. Of importance in this thesis is how different sensory modalities interact with one another and alter each other’s processing.
The electronic tongue - how does it work and can it replace a sensory panel?

At DuPont Nutrition & Health, sensory analyses of food are normally carried out using a trained sensory panel. However, DuPont Nutrition & Health are interested in testing alternative instrumental methods that can supplement the sensory analysis of food using a trained sensory panel. The objective of this master project is to study the relationship between data from the electronic tongue and the data from the sensory panel. Focus will be on bitterness perception of peptides in model systems as well as in different food matrices.

What is an electronic tongue?
An electronic tongue is an instrument that simulates the human tongue. It works as a biosensor. A number of chemical sensors interact with solved or dispersed components, including the basic tastants salt, sugars, acids and bitter compounds. The interaction results in electric signals that simulate the taste function of the tongue.
Acceptance of organic, bitter and healthy vegetables in the public food service sector and among consumers

SHORT PROJECT DESCRIPTION

The goal of many public kitchens is to increase the ratio of organic food in their production of meals. Vegetables, including cabbage and root vegetables, are important ingredients in organic meals. The student will focus on the impact of applicability and preparation of these vegetable on the use and acceptance of meals in a hospital kitchen and vegetable delivery to Årstiderne’s consumers, respectively.

PHYSICAL LOCATION OF THE PROJECT
AU-Aarslev, Kirstinebjergvej 10, DK-5792 Aarslev

PROJECT START
Any time

EXTENT AND TYPE OF PROJECT
45 or 60 ECTS master thesis project

MAIN SUBJECT AREA
Sensory and consumer analysis

MAIN SUPERVISOR
Associate Professor Ulla Kidmose
Department of Food Science
Aarhus University
E-mail: ulla.kidmose@food.au.dk
Phone: +45 87158293
Homepage: http://food.au.dk/
Optimization of low protein imitation cheese

SHORT PROJECT DESCRIPTION

KMC develops, produces and sells potato-based food ingredients that are used in applications, such as imitation cheese. The goal is to obtain melting and stretching properties that are as much alike the original imitated product. However, when the protein level of the cheese is reduced, some of these properties are compromised. In this context, KMC’s modified potato starches are useful substitutes for milk protein in cheese.

The objective of this master project is to investigate the effect of chemical and physical interactions between milk proteins, potato starch and water in low protein imitation cheese, with special focus on optimizing specific product properties, such as improving the stretchability by studying the effect of specific processing parameters. Thereby the effect of a range of different processing parameters will be investigated, and analytical methods as e.g. Mixolab, low-field NMR will be employed, while the final product will be evaluated by Texture Analysis.
SHORT PROJECT DESCRIPTION

Food and meals in schools are not only about securing availability of healthy foods but requires that the context in which the food is eaten supports that children can eat and enjoy their food. At this point, information about the meal setting in schools is limited.

In this project the focus is at how the setting can be optimized to facilitate and support healthy eating. The student will explore factors of importance for facilitating healthy and joyful eating and investigate the effect of changing meal settings in schools on intake and the eating experience.
Influence of different product and sensory profiling methodology factors on the perceived bitterness of beer

**SHORT PROJECT DESCRIPTION**

Beer is an intriguing product, because it is complex and has a wide range of controllable and very specific sensory characteristics depending on its source and brewing basis. Furthermore, some of the flavour and taste components in beer, especially bitterness, are still not identified.

The MSc project will study how different product factors (type of beer; barley, yeast, hops) and sensory profiling methodology factors (type and length of scale, sample presentation and training of panel) influence the perceived bitterness of beers.

The MSc project will be part of a larger project called DNA-shapes (full title: Analysis of Complex Biological Mixtures by A Novel Method: “DNA-Shapes” – A Model for Artificial Taste). The aim of the project is to endeavour to mimic and potentially gain a more comprehensive understanding of human taste perception by linking DNA-segmentation profiles to ultra-sensitive sensory profiles of complex food mixtures. This requires very sensitive sensory profiling methods in able to measure perception on a molecular level. Therefore, a part of the DNA-shapes project investigates how to optimize key factors in two areas (product and methodology) involved in sensory profiling.
Optimizing the method for measuring the satiating capacity of foods

SHORT PROJECT DESCRIPTION

Designing food and beverages that make consumers feel full faster and for longer are one of the top priorities in Danish food industry R&D.

In this MSc project you will work with the method to measure the satiating capacity of foods—the so called “pre-load – ad libitum” methodology. The principle behind this method is that changes in satiating capacity of a test food will result changes in intake at a subsequent meal. Put more precisely, you determine the satiating capacity of a pre load test food through the measure of intake in a subsequent ad libitum meal.

Despite the wide use of this method, there is little work done on optimizing the method. In this MSc project, you will test the effectiveness of the method when changing the time elapse between intake of the pre load and the ad libitum meal.

Ingredients to create beverages with different satiating capacity will be delivered by Arla Foods Ingredients and Arla Foods Amba.

PHYSICAL LOCATION OF THE PROJECT
AU-Aarslev, Kirstinebjergvej 10, DK-5792 Aarslev

PROJECT START
Any time, preferably summer 2017

EXTENT AND TYPE OF PROJECT
45 or 60 ECTS master thesis project

MAIN SUBJECT AREA
Sensory and consumer analysis

ADDITIONAL INFORMATION
Co-supervisor Post Doc Barbara Vad Andersen, phone 87156000, barbarav.andersen@food.au.dk

MAIN SUPERVISOR
Professor Derek Victor Byrne
Department of Food Science
Aarhus University
E-mail: derekv.byrne@food.au.dk
Phone: +45 87158394
Homepage: http://food.au.dk/
A healthy feeling—what sensations are created as a consequence of healthy eating?

SHORT PROJECT DESCRIPTION

In the recent years, the Food Industry’s need for asking, “how much” and “why” a product is liked, is supplemented with a need for asking “how does the product make you feel”. This need can be explained in terms of an increased focus on healthy products—products which are not only healthy from a biological perspective but also make people “feel better”.

This MSc project is related to the OmniSaM project funded by “The Arla Foods Dairy Health and Nutrition Excellence Center”. In OmniSaM we focus on dairy products with increased satiating capacity through alterations in protein content. However, an area that needs to be addressed more extensively is the sensations experienced as a consequence of eating.

In the MSc project you will study dynamics in mental—(e.g. desires, motivations and satisfaction) and physical (e.g. stomach rumbling, energy) sensations experienced after intake of meals with altered protein content. These sensations are relevant for the overall appreciation of the food and repeated purchase.
**SHORT PROJECT DESCRIPTION**

Monitoring of volatile organic compounds (VOCs) released from plant material is a new analytical approach directed on better understanding the physiological and chemical processes that occur in fresh fruit and vegetables after harvest. The information obtained by analyzing VOCs during postharvest storage of leafy green vegetables will be used to develop a new tool for prediction of quality changes such as off-odor formation, senescence, spoilage and produce degradation. The proposed project is aimed to study the relationship between VOCs emitted by different leafy green vegetables (spinach, tatsoi, Swiss Chard...) and changes in their quality during postharvest storage.

**Methodology:**

- Determine VOC profiles of selected leafy green vegetables by GC-MS
- Monitor release of VOCs from fresh produce during storage
- Perform sensory expert evaluation and analysis of microorganisms
Testing a future vegetable

SHORT PROJECT DESCRIPTION

Through traditional breeding, crossing of rapini (Brassica rapa) and a rapeseed (Brassica napus) with white flowers has resulted in the new vegetable colzacoli. We expect the vegetable to have a distinct taste and a unique profile of secondary metabolites which is linked to human health. In the project you will have the possibility to analyze for plant content of glucosinolates, carotenoids or polyphenols.

Depending on when the project starts, an evaluation of the sensory properties (taste) can be carried out as well. Furthermore, the project gives you the possibility to get insight into a small breeding company and its work.
Investigating healthy compounds in green leafy vegetables of white flowering rapeseed

**SHORT PROJECT DESCRIPTION**

All Brassica crops such as cabbages contain the potential health-beneficial secondary metabolite glucosinolate, which is furthermore related to the taste of the plant. They also contain other secondary metabolites of relevance to human health such as carotenoids and polyphenols.

The content of secondary metabolites can be modified through growing conditions of the crop e.g. fertilization levels, plant developmental stage at harvest, light level and temperature, thereby resulting in potentially healthier vegetables.

With this starting point you have the possibility of making your own hypothesis or you can use one already given in the project. You will learn the basic principles of setting up an experiment, analyze the plant content of a secondary metabolite besides data analysis.

Furthermore, the project gives you the possibility to get insight into a small breeding company and its work.

**ADDITIONAL INFORMATION**

The master project will be linked to an industrial postdoc project working on new products of green leafy vegetables (salad or seedlings) developed from white flowering rapeseed (Brassica napus) together with the breeding company Knold & Top ApS. The company uses the scientific results in their business selling seeds.
Discover the surface/foaming properties of whey protein

SHORT PROJECT DESCRIPTION

Background:
A variety of different whey protein products are produced by Arla Foods Ingredients (AFI). Our ingredients are sold for pediatric, sport nutrition, medical nutrition, health foods, dairy and bakery.
Our mission is “We are here to discover and deliver all the wonders whey can bring to people’s lives”.
AFI assisting the food industry to develop and efficiently process more natural, functional and sustainable foods.
To achieve this, it would be interesting for AFI to gain more knowledge about the surface properties of whey proteins.
Especially foam ability, but emulsifying ability could also be interesting.
To replace other emulsifier and stabilizer to achieve more natural foods.

Aim:
The aim is to achieve more knowledge about the surface properties of whey proteins.
The ability of the whey proteins to lower surface tension and form film / interface (interface rheology).
Knowledge of how whey proteins effect foam structure and foam stability, and effect of salts /minerals, lactose, pH and ionic strength on the foam ability of the whey proteins.
Additionally, it might be interesting to initiate new analyzes in this area.