

Aude Watrelot

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Area of expertise:

Food and Wine Chemistry

Interests beyond expertise:

Understanding phenolic compound chemistry in food and wine

Prerequisites:

The student should have a previous chemical lab experience including using micropipets, analyzing pH, titratable acidity, understanding and being able to run calibration curves, and being able to report data in an appropriate manner. The student has to be interested in learning about analytical chemistry.

Research Topic:

Summer is the time when grapes grow and we get ready for the production of wine. This summer, one of my lab research project will be focusing on grape collection and chemical characterization of the various parts of the berries, in term of phenolic compounds and cell wall material.

Goals Objectives:

The overall goal of this project is to better understand the chemical composition of cold-hardy grapes growing in different regions of Iowa and other states. The student will be responsible for chemical characterization of basic parameters such as degree Brix, pH, organic acids, sugars, etc. and for the characterization of phenolic compounds in berry parts of different grape variety. The student can expect to learn the following skills during his/her research study in Watrelot's lab: • Team work • Research philosophy • Communication • Analytical chemistry

Buddhi Lamsal

Address as: Dr. Lamsal
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Area of expertise:

Biorefining agricultural resources for food, feed, and industrial applications, Fermentation and enzyme applications in grain/food processing, Biosurfactants and biobased products, Food and non-food use of proteins and polysaccharides, Food engineering

Interests beyond expertise:

Food security and postharvest losses

Prerequisites:

Some microbiological and chemical laboratory exposure would be a good fit for the research.

Research Topic:

Optimization of fermentation conditions of extruded corn and wheat brans with different parameters to increase the nutritional profile. Some of the parameters includes solid-state and submerged state fermentation, inoculum percentage, slurry ratio, pH, time of fermentation, incubation temperature. After the fermentation, the modified substrates will be analyzed for protein, carbohydrates, fibers, lipids, phenolic contents, ferulic acid, phytic acid.

Goals Objectives:

The overall goal is to evaluate the effect of extrusion and fermentation on the high-fiber corn and wheat brans on nutritional and anti-nutritional compounds such as digestible and non-digestible carbohydrates, fibers, analysis of short chain fatty acid. Another objective is to determine the processing conditions during/after fermentation to improve the microbial viability.

Other Interests:

Traveling and hiking

Nicolas Delchier

Email: delchier@iastate.edu



Area of Expertise:

Food Chemistry

Research Goals and Objectives:

B group vitamins can be highly lost during food processing and food preparation. Two main mechanisms are responsible for vitamin B losses. They can either be lost by leaching into the surrounding liquid or they can be thermally degraded. Folate (vitamin B9) has been well studied while the mechanism still remains unclear for Pyridoxine. The study aims to understand the loss of pyridoxine during heat treatments, using a kinetic approach. Diffusion and heat treatment kinetics will be performed at different temperatures, samples will be stabilized and Pyridoxine will be quantified by HPLC. Models will be applied to data in order to determine kinetics parameters.

Prerequisites:

Food chemistry -analytical chemistry -mathematical modeling

Elizabeth McNeill

Address as: Professor McNeill

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Area of expertise:

Biochemical Nutrition, Neuroscience and Genetics

Interests beyond Expertise:

Mentoring students who are interested in pre-health professions.

Prerequisites:

General Biology

Research Topic:

- 1) The Role of miRNAs in Heart maintenance,
- 2) The impact of high fat diet in adult brain health,
- 3) The role of Glial miRNAs in synaptogenesis

Goals and Objectives:

The goal of this project is to better understand the role of antimicrobial peptides in the brain. Specifically, we will use qPCR to determine which if any antimicrobial peptides are significantly changed in RNA in specific regions of the brain of rodents fed a high fat diet. We will compare this to data we already have in the Drosophila brain and then use Drosophila genetics to examine the loss of specific conserved antimicrobial peptides as they relate to adult behavior as a read out of brain health. The skills used will be qPCR, RNA isolation techniques, Drosophila genetics and behavioral assays in Drosophila.

Other interests:

Discovering new places with my husband and daughter

Greg Curtzwiler

Address as: Dr. Curtzwiler

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Area of expertise:

Food packaging

Interests beyond expertise:

Food nutrient retention

Prerequisites:

chemistry, analytical

Research Topic:

Food nutrient retention

Goals Objectives:

Food nutrient retention, liquid chromatography

Other Interests:

Cycling

Joey Talbert



Address as: Dr. Talbert

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Area of expertise:

protein chemistry and enzyme technology

Interests beyond expertise:

statistics, food chemistry, synthetic biology

Prerequisites:

chemistry, biology, interest in the work, good attitude, works well with others

Research Topic:

Evaluation of tail fiber structure on the binding of bacteriophage to E. coli

Goals Objectives:

We are working to model the binding of phages to bacterial hosts. The model will enable the future prediction of host interactions as well as allow the design and synthesis of novel phage tail fibers that can target specific bacterial isolates. The objective of this project is to determine the binding capacity of different fibers. Students will work with a postdoctoral research associate on expressing protein tail fibers and will utilize developed assays to quantify the extent of binding.

Other Interests:

Running, chasing my kids

Kurt Rosentrater

Address as: Dr. Rosentrater
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Area of expertise:

Food processing, grain processing, environmental impact/sustainability analyses; cost analysis

Interests beyond expertise:

Gluten-free processing; petfood processing; green processing

Prerequisites:

None. All training will be provided at the beginning of the summer.

Research Topic:

Gluten-free grain processing

Goals Objectives:

The student will work closely with the mentor on designing an experiment to process gluten-free grain into various human products. Operations may include grain cleaning, separation, milling, and production operations such as extrusion. Skill and equipment operations will be taught to the student at the beginning of the project. Objectives will be to successfully manufacture gluten-free products that have physical and sensory characteristics comparable to traditional wheat-based products. Environmental impacts and costs will be estimated for these operations.

Other Interests:

Performing arts.

Malha Mellata

Address as: Dr. Mellata

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Area of expertise:

Microbiology / Immunology

Interests beyond area of expertise:

Host-bacteria interaction / food safety / prophylactic treatments

Prerequisites:

Previous course work in biology and/or microbiology is desired, but not required. Experience with wet lab work is also preferred but not required. We strongly encourage applications from motivated individuals seeking to significantly contribute to a research project.

Research topic:

Effects of dietary supplements on bacterial populations and the emergence of novel pathogens in an animal model of the human gut.

Objectives and Goals:

The emergence of multidrug resistance in pathogens is of immense concern in both animal and human health, due to the failure of these new and emerging bacteria to respond to regular treatments. The animal gut acts as a potent reservoir for the lateral transfer of whole genes between bacteria via extrachromosomal plasmid DNA. This project will utilize our recently developed animal-derived models for the gut mediated transfer of antimicrobial resistance genes between bacteria. In this project, we will evaluate whether dietary compounds affect the transfer of these genes between bacteria, such as foodborne bacteria *Escherichia coli* and *Salmonella*. As part of this study, the effect of the dietary modifications on host physiology and metabolism as well as the gut microbiota abundance, diversity, and resistome profile will be examined. This study aims to identify dietary modifications with a direct impact on the emergence and spread of antimicrobial resistance in the animal gut.

Other interests:

Gardening, Cooking, and Barbeque

Stephanie Clark

Address as: Dr. Clark

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Area of expertise:

Dairy foods and Sensory Evaluation

Interests beyond expertise:

Gardening, Painting, Crafting, ballroom dancing.

Prerequisites:

Microbiology laboratory (at minimum), preferable food microbiology.

Research Topic:

microbiological challenge studies in ice cream and cheese

Goals and Objectives:

The goal is to isolate and identify microorganisms in the ISU Creamery facility and products

Xiaolei Shi

Address as Dr. Shi

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Area of expertise:

Soft matters and food polymers

Research topic:

NASA EPScor project titled 3D printing of hydrogels for seed nursery in space.

Goals and objectives:

Control the seed orientation by customizing the seed container --improve the germination rate --a diversified, balanced, healthy diet to crew members.

Prerequisites necessary:

Food chemistry laboratory skills are required. Better to have experience with food engineering.

Other Interests:

Cooking

Qian Wang

Address as: Qian

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Area of Expertise:

Neuroscience and Molecular Biology

Other interests:

Computer science, robotics, and Fishing

Prerequisites:

The students should have basic understanding of biology and chemistry, critical thinking skills to solve problems, and enthusiasm to work independently and keep up with schedule. Wet lab experience such as cell culture and genetic modification is preferred.

Research Topic:

Developing stem cell models for Alzheimer's Disease.

Goals and Objectives:

Research will focus on the relationship between aging, Alzheimer's disease and genetic polymorphism. Undergraduate research assistants will help with cell culture experiments, such as maintaining cell lines, immunocytochemistry, cell transfection, cDNA plasmid preparation, western blot and related fluorescence and confocal microscopy.

Lingling Lui

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Area of expertise:

(1) Reduction of agricultural and food wastes/byproducts via transformation into value-added nano-biomaterials (e.g., nanocellulose);

(2) Physicochemical and nutritional changes of agricultural and food products during processing and storage;

(3) Using simulated in vitro digestion models for the study of bioaccessibility of functional foods and fate of nano-biomaterials;

(4) Development of food coating or film materials;

(5) Detection and disinfection of foodborne viruses (e.g., hepatitis A virus and norovirus)

Interests beyond expertise:

Nano-emulsion; nano-encapsulation; protein beverage research and development

Prerequisites:

Have taken at least one engineering or chemistry course in high school/college

Research Topic:

Project 1. Preparation of protein beverage from hemp heart protein;

Goals Objectives:

Project 1:

Preparation of protein beverage from hemp heart protein

- **Overall goals:**

The overall goal is to prepare stable protein beverage using hemp heart protein.

- **Specific objectives:**

1) Formulate protein beverage using different concentrations of hemp heart protein and flavor additives;

2) Test the stability (including particle size and zeta potential) of protein beverage under different temperature overtime;

3) Sensory evaluation of formulated stable protein beverage.

- **Skills/tools:**

Students will participate in organizing sensory evaluation tests, as well as learn how to use multiple instruments that are often in the food industry including particle size analyzer, zeta potential analyzer (for surface charge measurement), stir plate, pH meter.

Project 2:

Transformation of food and agricultural byproducts into value-added nano-biomaterials

- **Overall goals:**

The overall goal is to add values to food and agricultural byproducts such as soybean residues by transforming them into nano-biomaterials

- **Specific objectives:**

1) Pretreatment of food and agricultural byproducts by washing, drying, grinding, and sieving;

2) Chemical treatments to reduce the particle size of dried food/agricultural byproducts into nanometer;

3) Characterize the physicochemical properties of the byproduct-derived nano-biomaterial.

- **Skills/tools:**

Students will learn the usage of multiple lab instruments such as grinders, pH meter, sieves, water bath, centrifuges, particle size analyzer, zeta potential analyzer, transmission

electron microscopy. Students will also learn how to prepare chemical solutions, as well as carry out chemical reactions.

Project 3:

Development of edible coatings to enhance nut quality and shelf life

- **Overall goals:**

The overall goal is to develop and apply edible coatings to enhance the quality of nuts (e.g., pecan) and their shelf life

- **Specific objectives:**

- 1) Formulate edible coatings using food hydrocolloids and other additives (antioxidants, etc.);
- 2) Apply coatings onto nuts and store under different conditions;
- 3) Test the lipid oxidation and sensory evaluation of coated nuts after storage

- **Skills/tools:**

Students will participate in organizing sensory evaluation tests, as well as learn how to develop and apply coatings to nuts, and perform chemical analysis such as free fatty acid determination.

Other Interests:

Basketball, running, and movies

