Available Undergraduate Research Award Supervisors from the Faculty of Agricultural and Food Sciences

AGRIBUSINESS AND AGRICULTURAL ECONOMICS

DR. DEREK BREWIN
Derek.Brewin@umanitoba.ca

Derek Brewin is a Professor and Head of the Department of Agribusiness and Agricultural Economics. He has a Ph.D. from Penn State University in Agricultural, Environmental and Regional Economics. His most recent research has focused on the economics of crop rotations, grain transportation by rail, and supply chain disruptions in the grain sector.

DR. JARED CARLBERG
Jared.Carlberg@umanitoba.ca

Jared Carlberg's interests are in the economics of food and nutrition.

ANIMAL SCIENCE

DR. KARMIN O
Karmin.o@umanitoba.ca or karmino@sbrc.ca

Potential URA project – 2021: We are currently conducting research into the scientific basis of natural products in disease prevention and management in humans and animals with focus on oxidative stress, inflammatory response, nutrient absorption and metabolism. Our laboratory uses multidisciplinary approaches to investigate health related effects of nutraceuticals, functional food and herbal medicine. Specifically, we investigate the biochemical and molecular mechanisms of the beneficial effects of various extracts and compounds in multi-experimental models including: (1) antioxidant properties using the in vitro and in vivo assays, (2) inflammatory responses by measuring biomarkers to detect inflammation in humans and animals at the molecular, protein and gene levels, (3) regulation of dietary nutrient absorption in the gut, and (4) functional evaluation including blood parameters, lipoprotein profile, enzyme activities, cardiovascular, liver and kidney functions.

Current research projects:

- Impact of oxidative stress and antioxidants in health and disease progression in humans and animals with focus on nutrient absorption and metabolism in the gut and liver;
- Regulation of inflammatory response and lipid metabolism in metabolic disorders (fatty liver disease, hyperhomocysteinemia, diabetes, obesity) and cardiovascular disease;
- Prevention and treatment of ischemia-reperfusion induced acute kidney injury (AKI) and chronic kidney disease (CKD);
- Beneficial effect of folic acid supplementation, berberine, tyrosol and other compounds isolated from agricultural products and herbal medicine in health.

ANIMAL SCIENCE continued…

DR. KIM OMINSKI
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Project Description: Globally, food waste and loss is staggering – with losses of 30% for cereal foods, 45% for fruits and vegetables, 20% for oilseeds and pulses, 45% for roots and tubers, 20% for dairy products, 30% for fish and seafood, and 20% for meat (Mottet 2019). In Canada, total avoidable and unavoidable annual waste along the food value chain is estimated to be 35.5 million metric tonnes, 32% of which is avoidable and valued at $49.5 billion (Gooch et al. 2019). Potential inclusion of food waste in livestock diets is a preferred strategy for food waste management, as compared to composting or disposal of food wastes in landfills. This project will examine the potential of using food waste streams, as well as by-products from Canadian cropping systems in livestock diets.

BIOSYSTEMS ENGINEERING

DR. YING CHEN
Ying.Chen@umanitoba.ca

Research Interests: Soil-tool-material interactions associated with tillage & seeding machines; processing of agricultural fibres.

DR. NAZIM CICEK
Nazim.Cicek@umanitoba.ca

Research Interests: Treatment of livestock waste, municipal wastewater, and industrial wastewater. Production & utilization of biomass, biopolymers, and bioenergy.

DR. CHYNGYZ ERKINBAEV
Chyngyz.Erkinbaev@umanitoba.ca

Research Interests: Smart technologies in food process engineering.

DR. FUJI JIAN
Fuji.Jian@umanitoba.ca

Research Interests: Studies of insect biology; detection and control of insects & moulds; grain physical properties, grain drying, mathematical modeling of the stored-grain ecosystem.

DR. DAVID LEVIN
David.Levin@umanitoba.ca

Research Interests: Production, properties, and biodegradability of biopolymers, and the manufacture of biodegradable food-packaging materials using biopolymers.

DR. SONG LIU
Song.Liu@umanitoba.ca

Research Interests: Surface engineering of polymeric materials for medical and biomedical applications (surgical drapes, catheters, vascular grafts, ligament & tendon prostheses) to enhance biological interactions.

BIOSYSTEMS ENGINEERING continued…

DR. DANNY MANN
Danny.Mann@umanitoba.ca
Research Interests: Ergonomics of agricultural guidance systems; remote supervision of autonomous agricultural machines; safety issues associated with agricultural machines.

DR. JASON MORRISON
Jason.Morrison@umanitoba.ca

Research Interests: Biofibre collection, separation, and grading of all stages using imaging, spectroscopy and mechanical assessment. Material properties assessment of biologically sourced and/or bio-compatible materials.

DR. JITENDRA PALIWAL
J.Paliwal@umanitoba.ca

Research Interests: Infrared spectroscopy and electromagnetic imaging (visible, near-infrared hyperspectral, radio frequency, and X-ray) for quality assessment of raw and processed food products.

DR. MASHIUR RAHMAN
Mashiur.Rahman@umanitoba.ca

Research Interests: Development of natural textile fibres; sustainable textile processing.

DR. R. SRI RANJAN
Sri.Ranjan@umanitoba.ca

Research Interests: Irrigation; drainage; remediation of contaminated soils & groundwater; instrumentation for soil & water monitoring.

DR. JILLIAN SENIUK CICEK
Jillian.SeniukCicek@umanitoba.ca

Research Interests: Engineering Education, Indigenous methodologies and approaches to research and education

DR. QIANG ZHANG
Qiang.Zhang@umanitoba.ca

Research Interests: Airborne disease transmission; air quality in animal facilities; airflow through porous media.

DR. WEN ZHONG
Wen.Zhong@umanitoba.ca

Research Interests: Functional electrospun nanofibers for biomedical applications including wound care and tissue engineering.

ENTOMOLOGY

DR. KYLE BOBIWASH
Kyle.Bobiwash@umanitoba.ca

Studies on crop pollination, pollination ecology, northern insect biodiversity, Indigenous agricultural or land development management.

DR. ALEJANDRO COSTAMAGNA
Ale.Costamagna@umanitoba.ca

Studies on insect ecology in agroecosystems, predator/prey/plant interactions, landscape ecology of arthropods, beneficial insect traits, are potential topics.

DR. JASON GIBBS
Jason.Gibbs@umanitoba.ca

Studies on insect ecology in agroecosystems, predator/prey/plant interactions, landscape ecology of arthropods, beneficial insect traits, are potential topics.

DR. KATERYN ROCHON
Kateryn.Rochon@umanitoba.ca

Studies on the relationship between tick abundance on pastures and on cattle. Research will involve sampling for ticks in various environments and looking for ticks on cattle.

FOOD AND HUMAN NUTRITIONAL SCIENCES

DR. HAROLD AUKEMA
harold.aukema@umanitoba.ca

My Nutrition and Lipid Mediators laboratory is located in the St. Boniface Hospital Albrechtsen Research Centre. The novel lipid mediators that we study are called oxylipins, which are made from dietary fatty acids. The many types of oxylipins derived from these fatty acids regulate a host of biological activities and can mediate both protective and detrimental effects. Our current work is studying the effects of diet on oxylipins and their roles in health and disease. For example, in a recent pre-clinical study we showed that inhibiting a set of oxylipins in a model of polycystic kidney disease reduced disease progression, providing a potential strategy for treating this disorder in humans. Recently, we discovered that some oxylipin levels are different in males and females, and we are studying how these sex differences are altered by diet. We also are using oxylipins to help us assess dietary essentiality of omega-3 fatty acids.

DR. NANDIKA BANDARA
Nandika.Bandara@umanitoba.ca

Dr. Bandara's research group is focused on developing innovative technologies for protein extractions, modifications, and developing value-added applications for proteins such as biodegradable food packaging materials, adhesives, biomedical materials, and nanodelivary systems for drug/bioactive compound delivery. Material science and nanotechnology principles are extensively integrated with traditional food science research areas to achieve these targets.

FOOD AND HUMAN NUTRITIONAL SCIENCES continued…

DR. PETER ECK

Peter.Eck@umanitoba.ca

Dr. Peter Eck, Associate Professor, Department of Human Nutritional Sciences at the University of Manitoba, investigates the impacts of genetic variations on health outcomes which are modifiable by lifestyle interventions. He discovered novel vitamin C transporters and associated their genetic variations with a variety of common and complex diseases. He also associated variations in various other nutrient membrane transporter genes with Inflammatory Bowel Diseases. He investigates the biological impact of disease associated genetic variations using molecular biology, cell biology and model organisms. Dr. Eck's research aims to contribute to the development of personalized lifestyle interventions based on individual's genetic background.

DR. JIM HOUSE

James.House@umanitoba.ca

Dr. House maintains research programs in 3 primary areas: 1) understanding factors regulating sulphur amino acid metabolism in animals; 2) sustainable egg production systems, including novel value-added egg products; and 3) determining factors influencing the quality of dietary proteins.

DR. MANEKA MALALGODA

maneka.malalgoda@umanitoba.ca

Dr. Malalgoda's research focuses on grain chemistry and processing quality. With the growing interest in plant-based protein ingredients, currently Dr. Malalgoda is studying oat processing (dehulling, milling and defatting), protein extraction methods and oat protein structure-function relationships. The goal of this program is to gain an in-depth understanding about the chemistry of oat proteins so that oat can be used as a protein source in versatile applications.

DR. MOHAMMED MOGHADASIAN

mmoghadasian@sbrc.ca

Dr. Moghadasian's research activities include investigations of health benefits of functional foods.

DR. NATALIE RIEDIGER

Natalie.Riediger@umanitoba.ca

Dr. Riediger is interested in food and nutrition policy, nutritional epidemiology, Indigenous health, and health equity. She utilizes qualitative, quantitative, and mixed-methods in her research.

DR. MIYOUNG SUH

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Fetal alcohol spectrum disorder (FASD) is commonly recognized as an alcohol-induced brain disease. One of the underlying pathogenesis is alcohol-induced brain inflammation. It has been shown that alcohol increases the activation of the inflammatory-induced NF-κB, which in turn mediates inflammation and affects cell survival. Inflammation regulation is vitally important for the developing brain because hippocampal inflammation has been shown to reduce memory function. Omega 3 fatty acids, docosahexaenoic acid (DHA)

has been shown to reduce NF-κB pathway activation in the brain, thereby reducing inflammatory mediators. However, no study has reported whether DHA during prenatal alcohol exposure leads to a reduction in hippocampal inflammation via reduced NF-κB signaling. Thus the overall objective of this study is to examine the effects of maternal dietary DHA on fetal brain development, specifically identifying the role of NF-κB inflammatory signaling activity and examining histological alterations. Overall this study will provide a basis of developing effective nutritional strategies to prevent or mitigate symptoms of FASD.

PLANT SCIENCE

DR. BELAY AYELE

Belay.Ayele@umanitoba.ca

- Physiology, functional genomics and biotechnology of cereal crops
- Plant hormones/growth regulators
- Seed biology
- Abiotic stress tolerance
- Feedstock development for bioproducts

DR. DOUGLAS CATTANI

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- Perennial grain breeding including grains and oilseeds
- Companion crop development
- Plant growth and development and its utilization for selection in perennial crop breeding programs
- Polyculture development
- Forage crop growth and development
- Perennials for bioenergy use

DR. ROBERT GULDEN

Rob.Gulden@umanitoba.ca

- Weed biology, ecology and function above and below ground
- Integrated weed management
- Factors affecting weed community assembly
- Crop/weed competition and resource capture
- Weed/soil-microbe interactions
- Extracellular DNA in the environment

SOIL SCIENCE

DR. INOKA AMARAKOON

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The ability to recycle livestock manure into agricultural soils while keeping soil and water resources clean is vital for the sustainability of livestock cropping systems. The Canadian livestock industry uses approximately one million kilograms of antibiotic active ingredients annually, and antibiotics are readily excreted and hence detected in manure. Antibiotics in manure-amended soils are susceptible to transport by processes such as spring-thaw snowmelt runoff, rainfall-runoff, and leaching. Antibiotics entering the broader environment pose a risk to ecosystem functioning and human health, particularly by contributing to rising antibiotic resistance, which is one of the most urgent public health emergencies of our time.

My research focuses on the fate of antibiotics in the agroecosystem. There are opportunities for researching antibiotic transport in snowmelt runoff and leaching in manure amended cropland. Students can participate in sample collection, conducting laboratory analysis to quantify antimicrobials, data analysis, and knowledge dissemination. There are also opportunities for leading an independent project of your choice within the listed area of research. Students can gain skills in environmental chemistry, soil science, contaminant transport, analytical chemistry, experimental design, and statistical analysis, as well as organizational, leadership, and teamwork skills through participating in a field study.

DR. PAUL BULLOCK

Paul.Bullock@umanitoba.ca

Developing a Fusarium Head Blight Risk Model to Improve Cereal Production in Western Canada

Fusarium Head Blight (FHB) is a major fungal disease that affects cereal crops (wheat, durum and barley) here in Canada and around the world. It produces mycotoxins that make the grain unsafe for human or animal consumption. The main goal of the project is to develop weather-based models for forecasting the risk of FHB in Western Canadian cereal crops. The models will help farmers decide whether to spray or not to spray against the disease. This will benefit the environment by reducing unnecessary use of pesticides while increasing farmers' income and the sustainability of agriculture.

What you will learn:

i) Setting up and programming weather stations
ii) Downloading and quality checking weather data
iii) Interviewing farmers
iii) Collecting agronomic and crop disease data
iv) General knowledge on model development
iii) Networking (interacting with farmers, small-plot managers and Provincial agriculture staff)

Executing the project requires a lot of travelling in Manitoba, Saskatchewan and Alberta; thus if you enjoy travelling this will be a good opportunity. For more details on this exciting project contact either:
Dr. Manasah Mkhabela or Dr. Paul Bullock

DR. ANNEMIEKE FARENHORST

agresear@umanitoba.ca

Dr. Annemieke Farenhorst has a diverse research program and welcomes students from all Faculties. Her natural science research focuses on the fate of pesticides and antimicrobials in soil and water, for example how these chemicals are retained by matrices such as soils, sediments, plants, microplastics and biochars. In

SOIL SCIENCE continued…

2021, we are particularly welcoming undergraduate students who are interested in better understanding the functionality of on-farm biobeds that are designed to reduce the point-source pollution of water resources by current-use pesticides. As part of other studies, we also welcome undergraduate students who have an interest in advocating for better drinking water quality in First Nations reserves. These undergraduate students would work with a team that has been monitoring for bacteria and antibiotic resistance genes in tap water of First Nations homes, and also has been conducting surveys to better understand the impact of poor drinking water quality on First Nations. In addition, we are seeking undergraduate students who are fluent in Swedish or German and have an interest in social science research. These students have opportunities to participate in an international study that examines the reasons why women either stay in or leave academic and private sector engineering and information technology jobs in Canada, Germany, and Sweden.

DR. XIAOPENG GAO

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Dr. Xiaopeng Gao's research focuses on the development and application of best management practices to improve soil fertility and nutrient management in agroecosystems. In 2021, Dr. Gao's lab welcomes undergraduate students in participating a project to do a meta-analysis on fertilizer nitrogen management for major cropping systems in Canada. The project aims to quantify the effectiveness of 4R nutrient stewardship of applying fertilizer nitrogen at the Right rate, Right source, Right time and Right placement on improving crop productivity and nitrogen use efficiency, while reducing nitrogen losses into environment through pathways of N_2O emission, NH_3 volatilization and nitrate leaching. Students will be involved in a comprehensive literature search, setup of database, and will have excellent opportunities to learn skills of data processing, meta-analysis, and interpretation of results into report or manuscript.

DR. DAVID LOBB

David.Lobb@umanitoba.ca

Dr. Lobb has positions available this coming summer to support three NSERC-funded projects. The students' research activities will be structured to provide opportunities to develop individual research projects for the students. These projects are related to soil erosion and sedimentation. Specifically,

(i) the assessment of soil erosion using fallout radionuclides,
(ii) tracking and sourcing sediment using fingerprinting techniques, and
(iii) development of new techniques to restore severely eroded soil.
(iv) understanding the role of surface drainage systems in the transfer of water, sediments and contaminants in agricultural watersheds.

DR. MARIO TENUTA

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Students have the opportunity to work in one or several studies in the NSERC Industrial Research Chair Program and Applied Soil Ecology projects. Mainly field focused studies include the mitigation of greenhouse gas emissions from agriculture, (e.g., using 4R nitrogen management practices to reduce nitrous oxide emissions from fertilizer use), micrometeorological determinations of greenhouse gases and ammonia from soil, and yield response to 4R nitrogen management practices of field crops. Lab based studies include soil health indicators; management of potato early dying disease (Verticillium dahliae), survey of soybean cyst nematode (Heterodera glycines), and crop host preference of stem nematodes and root lesion nematodes of pulse crops.

SOIL SCIENCE continued…

DR. FRANCIS ZVOMUYA
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The research focuses on the agronomic and environmental aspects of recovered struvite as phosphate fertilizer for crops. Struvite is a form of phosphorus recovered from wastewater, liquid manure, and other waste streams when phosphorus reacts with ammonium and magnesium ions. It has lower solubility than commonly used phosphate fertilizers and may therefore present a lower toxicity risk to seed and seedlings when applied at adequate rates. The project is aimed at testing this hypothesis as well as characterizing the behavior of phosphorus forms when struvite is applied to soils. Students will be involved in collecting soil and plant samples and analyzing these in the laboratory. They will also learn experimental design, data processing and statistical analysis techniques, as well as report preparation and interpretation of experimental results.