



**9th ANNUAL  
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RESEARCH AWARD (USRA)  
POSTER PRESENTATIONS**

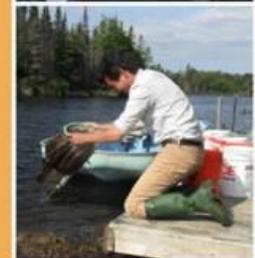
Tuesday, September 15, 2015  
16:00 - 18:00  
MACDONALD-STEWART MS2-022  
(FACULTY LOUNGE)  
Macdonald Campus

Guest of Honour  
**Doctor Suzanne Fortier**  
*Principal and Vice-Chancellor*

Posters will also be available for viewing on  
Wednesday, September 16 from 09:00 - 16:00

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## **GENETIC DIVERSITY OF CAREX LIMOSA L. IN NORTH AMERICA**

**Botzas-Coluni, Julie**

**Supervisor:** Prof. Marcia Waterway, Department of Plant Science

*Carex limosa*, commonly known as the mud sedge, is a circumboreal species and wetland obligate. Wetlands are important habitats ecologically, however many of them are threatened by human development and climate change. Thus, more information on *C. limosa*'s population structure and genetic diversity is needed in order to better understand its resilience in the face of potential future threats (Gage & Cooper, 2006). Populations across North America were sampled, including from Quebec, Alberta and Colorado. Genetic diversity was assessed using microsatellite markers. Four markers previously developed for *C. limosa* were used. In addition, ten microsatellite markers developed for *C. scoparia* were tested on *C. limosa*. The four that cross-amplified successfully were then tested for their variability within and between populations of *C. limosa*. Preliminary tests for Hardy-Weinberg equilibrium and Structure analyses were conducted, however further work is needed to expand the data set and get a more complete picture of the genetic diversity of *C. limosa* in North America.

## **OBSERVED TREND OF CLIMATE CHANGE ON MONTREAL ISLAND AND SIMULATED TREND OF CORN YIELD**

**Bouchard, Erika**

**Supervisor:** Prof. Zhiming Qi, Department of Bioresource Engineering

Long-term trend of climate change in temperature and precipitation of 115 and 74 years were analyzed on Montreal Island at McGill's (1872-1986) and Pierre-Elliott-Trudeau's (1942-2014) weather stations. A significant increase of 1.88 °C (34%) and an annual increase of 23.9 mm (2.3 %) on a 100 years basis was observed at McGill and an increase of 1.18 °C (19%) and 138.8 mm (15%) over 100 years at P-E-T. The frequency of a 2-year return period and a 95% extreme rainfall events over years showed decreasing trends for McGill and increasing trends for P-E-T. Furthermore, growing parameters were calculated to see how climate change affected agricultural activities. The growing degree-days and the growing season length are both increasing with a growing season start occurring earlier than before. Finally, the root zone water quality model (RZWQM) is used to interpret climate effects on crops (maize and soybean) and better adapt farming practices.

## **FOOD SECURITY IN THE CANADIAN ARCTIC**

**Chen, David**

**Supervisor:** Prof. Elena Bennett, Department of Natural Resource Sciences

Food security in the Canadian Arctic is an important issue, with rates of food insecurity in the north much higher than the national average (68% compared to 7%). Currently, the Canadian Arctic is undergoing major changes, including ecological changes as well as socio-cultural changes. These changes will likely affect the food security status of people in diverse and interacting ways, yet we lack a framework that can address these changes in a holistic systems-based manner. I systematically reviewed the literature on Arctic food security and its potential response to rapid changes occurring in the Canadian Arctic. I used the results in a Drivers-Pressures-State-Impacts-Response (DPSIR) framework to assess how changes in the Arctic are likely to affect the food security status of people in the North. This framework emphasizes the important but diminishing role traditional foods play in the North, as well as new and alternative solutions in addressing Arctic food security issues. Finally, tackling food security in the Canadian Arctic will require a collaborative and interdisciplinary effort between stakeholders at local, regional and national scales.

## **THERMAL DEGRADATION OF BISPHENOL ANALOGS IN EXTREME COOKING CONDITIONS**

**Frazer-McKee, Anne**

**Supervisor:** Prof. Varoujan Yaylayan, Department of Food Science and Agricultural Chemistry

Bisphenol analogs (e.g. BPA or BPF) are widespread in the food packaging industry. Recently, 8 different bisphenol analogs were detected in food. This study investigated the thermal stability of bisphenol analogs to ascertain their hazards associated with cooking. To observe degradation, BPA, BPF and BPS were heated at 250°C with pyrolysis-GC/MS. Likewise, BPA and BPC were heated with an OptiMelt device at 250°C with subsequent injection into GC-MS. Degradation of BPA only was found with pyrolysis, producing mainly phenol and p-isopropenylphenol; BPA degradation via OptiMelt also confirmed this degradation pathway. Due to structural resemblances, a similar degradation mechanism for BPC was proposed but has yet to be confirmed. Similar experimentation on the remaining bisphenol analogs would elucidate whether these compounds thermally degrade or not; standard addition/injection would allow for the identification of products found here and in future studies, allowing for a complete risk assessment of cooked foods.

## **FOOD SECURITY IN NORTHERN CANADA PROJECT: GREENHOUSE PROTOTYPE CLIMATE/TEMPERATURE TESTING AND ANALYSIS**

**Gaudet, Patricia**

**Supervisor:** Prof. Mark Lefsrud, Department of Bioresource Engineering

The Food Security in Northern Canada (SINC) project incorporates both greenhouse and growth chamber technologies into a single highly efficient unit. In order to optimize the Food SINC unit for northern climates a prototype was built on the McGill Macdonald Campus under the supervision of Dr. Mark Lefsrud from the department of Bioresource Engineering. Testing of the prototype started during winter 2014 to record the Food SINC's heat retention capabilities during the winter months. Best climate conditions for the transition from insulated growth chamber to solar greenhouse were also observed during these months. Temperature and climate conditions continued to be recorded throughout summer 2015 in response to a ventilation system installed in the Food SINC unit to control excess heat during the summer months. Added features to the prototype such as insulated exterior retractable panels for supplemental insulation were also tested and inside temperature data was collected and analyzed.

## **DIGESTS FROM TWO ANTHOCYANIN-RICH PURPLE POTATO CULTIVARS GENERATED FROM HUMAN SIMULATED GUT MODEL METABOLISM EXHIBIT GREATER CYTOTOXICITY IN COLONIC Caco-2 TUMOR CELLS COMPARED TO NORMAL COLONIC CCD-112CoN CELLS**

**How, Emily**

**Supervisor:** Prof. Stan Kubow, School of Dietetics and Human Nutrition

Previous literature has shown that anthocyanin-rich food extracts exert greater toxicity towards cancer vs. normal human colonic cells but their digests have not been evaluated. The cytolytic effects of the *in vitro* digests of two purple potato cultivars (Amachi, Leona) and two purple sweet potato accessions (PM09.812, PM09.960) meals containing a high anthocyanin content were evaluated in human colonic Caco-2 tumor cells and in CCD-112CoN normal cells via the lactate dehydrogenase (LDH) assay. Cells were treated for 24h with digests at concentrations from 0–100% in cell culture medium. Both sweet potato digests increased LDH production similarly in each cell line whereas digests of Leona (50-100%) and Amachi (100%) showed significantly higher LDH in Caco-2 vs. CCD-112CoN cells. The results show for the first time that digests from anthocyanin-rich foods may differ in their selective anticancer cytotoxicity, which may have implications towards recommendations of such foods for colon cancer prevention.

## **IMPLICATIONS OF GLOBAL BROWNIFICATION ON THE COMMON AQUATIC INSECT CHIRONOMUS VIA A WHOLE-LAKE EXPERIMENT**

**Koizumi, Shuntaro**

**Supervisor:** Prof. Chris Solomon, Department of Natural Resource Sciences

Many freshwater ecosystems, found within mid- and high-latitudes of the northern hemisphere have been experiencing gradual and long-term increases in dissolved organic carbon (DOC). This phenomenon is now being termed “global brownification” and has large impacts on affected freshwater ecosystems. Research recently conducted in the Solomon lab has been observing the effects of dissolved organic carbon (DOC) on lake ecosystems. These recent observations from whole-lake experiments, however, are showing unexpected results. It was found that with higher DOC concentrations, an increase in macroinvertebrate abundance was observed, especially with *Chironomus* larvae. This study focuses on how the life history of the *Chironomus* species has been affected and how it is adapting to these changes in low-oxygen conditions caused by increased DOC concentrations.

## **FREEZING TOLERANCE IN BRACHYPODIUM DISTACHYON: DOES THE PHOTOPERIOD HAVE ANY EFFECT?**

**Lambert-Rivest, Gabriel**

**Supervisor:** Prof. Jean-Benoit Charron, Department of Plant Science

In cold regions, episodes of freezing temperatures cause important economic loss for the cereals cultures industry. The study of cold acclimation mechanisms in cereals provides important insights that may lead to the improvement of crops' freezing tolerance. In wheat, change of photoperiod was shown to affect the plant capacity to tolerate freezing. Such effect remains to be characterized in *B. distachyon*, a model-organism related to wheat that allows the study of cold acclimation mechanisms at the molecular level. Accordingly, *B. distachyon* capacity to cold acclimate and tolerate freezing would be reduced by long-day photoperiod (LD), and increased by short-day photoperiod (SD). In this work, I compare the freezing tolerance and cold acclimation capacity of two *B. distachyon*'s accessions under LD and SD photoperiods. Accessions Bd18-1 (winter) and Bd21 (spring/facultative) differ in their response to cold and photoperiod, allowing me to isolate the effect that photoperiod has on cold acclimation mechanisms for *B. distachyon*. Therefore, this work provides a better understanding of freezing tolerance mechanisms in *B. distachyon* and agronomically important cereals.

## **DOSE-RESPONSE OF FATTY ACID PROFILES AND FAT MASS TO DOCOSAHEXAENOIC ACID IN YOUNG FEMALE SPRAGUE-DAWLEY RATS**

**Lévy-Ndejuru, Julia**

**Supervisor:** Prof. Hope Weiler, School of Dietetics and Human Nutrition

Consumption of docosahexaenoic acid (DHA), an omega-3 fatty acid, has been shown to promote health in animals and humans. DHA acts as an anti-inflammatory agent and influences glucose and lipid metabolism. Fatty acid profiles may vary among tissues in response to increased dietary DHA. The objective of this study was to test the dose response to dietary DHA in subcutaneous adipose, visceral adipose and lean tissue mass and fatty acid composition. In this study, female Sprague-Dawley rats (n=12/group) were fed diets containing 0%, 0.2%, 0.4%, 0.8% or 1.2% DHA for 10 weeks. Adipose tissue DHA followed a dose-response pattern. Muscle tissue showed higher DHA in 0.8% and 1.2% groups compared to the 0% group. Abdominal subcutaneous fat mass, but not visceral or lean tissue, was greater in the 1.2% than in the 0.4% group. Future studies should examine the detrimental effects of high dietary DHA on body composition.

## **GENETIC MARKERS IN GRANULOSA CELLS CORRELATING WITH SUCCESSFUL EMBRYO DEVELOPMENT IN PREPUBERTAL HEIFER CALVES**

**Michalovic, Laura**

**Supervisor:** Prof. Vilceu Bordignon, Department of Animal Science

Canadian dairy genetics are renowned worldwide. By shortening the generation intervals of genetically superior animals, the Canadian dairy industry can maintain its competitive standards. Recent advancements in genomic selection and in vitro embryo production technologies may now allow the production of offspring from elite animals at prepubertal ages. However, lower embryo development has been reported from oocytes recovered from prepubertal heifer calves compared to mature cows. In this study, bi-monthly laparoscopic ovum pick ups (LOPUs) were performed on 6 gonadotropin-stimulated Holstein heifer calves from 2 to 5 months of age. Cumulus oocyte complexes (COCs) were collected from ovarian follicles and the oocytes were fertilized and cultured in vitro. Although a good number of morphologically normal oocytes were recovered and fertilized, only a small proportion of them successfully developed into embryos. To explain the discrepancy between the total number of oocytes collected versus the total number of yielded embryos, we are addressing specific molecular markers expressed by granulosa cells.

## **HIGH DOSE AMINO ACID ADMINISTRATION PREVENTS HYPOAMINOACIDEMIA IN THE PRESENCE OF INSULIN THERAPY AFTER OPEN HEART SURGERY**

**Mooney, Patrick**

**Supervisor:** Prof. Linda Wykes, School of Dietetics and Human Nutrition

In patients receiving open-heart surgery, intensive therapy with the anabolic hormone insulin leads to a dramatic decrease in plasma amino acid (AA) concentrations. Decreased AA availability, in turn, inhibits an insulin-stimulated increase in protein synthesis. We hypothesized that infusion of amino acids may help prevent the development of hypoaminoacidemia. Patients were studied during and immediately after surgery while receiving intensive insulin therapy (IIT) with glucose and amino acids at either 0%, 20% (1.0g AA/kg/d) and 35% (1.8g AA/kg/d) of measured resting energy expenditure (REE). IIT suppressed endogenous glucose production and increased clearance of glucose from plasma while maintaining euglycemia. Compared to preoperative values, concentration of essential amino acids changed by -51%, -18% and +32% with infusion of AAs at 0%, 20% and 35% REE, respectively. High but not moderate dose amino acid infusion prevented a decrease in plasma amino acid concentration, suggesting increased availability for protein synthesis in stressed patients.

## **DIETARY CORRELATES OF BODY COMPOSITION IN YOUNG CHILDREN**

**Parsons, Kristina**

**Supervisor:** Prof. Hope Weiler, School of Dietetics and Human Nutrition

Nutritional intake affects child growth, influencing disease development in adulthood. The objective was to determine whether diet was related to body composition in 2 to 8 y olds (n=212) from Montreal. Height and weight were measured to calculate body mass index (BMI). Dual-energy x-ray absorptiometry (DXA) scans quantified lean and fat mass. Nutrient intake was recorded using 24 h dietary assessments and analyzed with Nutritionist Pro software. Pearson and Spearman correlations were used to test for relationships, and ANOVA for differences among age groups. Children were 4.2±1.6 y (mean±SD) with BMI z-score of 0.5±0.9 kg/m<sup>2</sup>. Energy and protein intakes were 87±24 kcal/kg and 3.6±1.2 g/kg, respectively. Energy and protein intakes were inversely related to LMI in preschoolers and school-aged children, suggesting that exceeding the recommendation does not benefit lean mass. Further investigation analyzing the effect of physical activity on body composition in children is warranted.

## **IMPROVING FORAGE GRASSES UNDER CONDITIONS OF CLIMATE CHANGE**

**Pomerleau-Lacasse, Florence**

**Supervisor:** Prof. Philippe Seguin, Department of Plant Science

Growing grasses in binary mixtures with alfalfa (*Medicago sativa* L.) improves forage digestibility and yield, and lowers weed composition relative to monocultures. Since the Quebec annual temperatures are projected to increase, and the summers to be dryer, our objective was to evaluate other cool-season grasses as alternatives to timothy. To do so, six grass species were seeded in binary mixtures with alfalfa. In the first post-seeding year, plots were harvested twice to determine the dry matter yield (DMY) and botanical composition. The DMY decreased by an average of 39.5% over the two cuts. The yields of festulolium and perennial ryegrass with alfalfa declined the most, and were significantly lower than other combinations. In addition, tall fescue inhibited alfalfa growth. All combinations had similar weed proportions. Based on the DMY and botanical composition alone, meadow fescue and meadow bromegrass would be the most valuable alternatives to timothy in a changing climate.

## **PARTICIPATORY AGROECOLOGICAL NETWORK MODELING: COMBINING COMMUNITY AND RESEARCH KNOWLEDGE**

**Rojas, Marcela**

**Supervisor:** Prof. Shiv Prasher, Department of Bioresource Engineering

Methods for assessing the ecological sustainability of agroecosystems have centered either on indicator-based approaches or large-scale qualitative ecosystem network (pest and beneficial organism) evaluations and have been lacking in mechanistic rigour and quantifiability, respectively. In this research we present a method for the participatory development of agroecosystem network models with stakeholder communities, which allows us to simplify these complex networks and compare agroecological networks in different agricultural management settings. The participatory method was designed for effective and rapid application in low-resource settings where time and resource-intensive identification of all insects present is not feasible. This study was performed in Guatemala in two case study regions of very close proximity with two different rural agricultural development paradigms for smallholder farming communities: market-based commercialisation and low-input subsistence-based approaches. The results suggest that the low-input agroecosystem has structural trophic characteristics promoting a more resilient and stable agroecological system.

## **APPLICATION OF FOCAL-PLANE-ARRAY FOURIER TRANSFORM INFRARED SPECTROSCOPY IN DEVELOPMENT OF ACTIVE PACKAGING FROM EDIBLE INGREDIENTS**

**Tsutsumi, Tamao**

**Supervisor:** Prof. Ashraf Ismail, Department of Food Science and Agricultural Chemistry

Currently, most packaging materials are manufactured from non-renewable resources and contribute to pollution; the current trend is to utilize raw materials from sustainable sources. In this work, edible films containing natural antimicrobials were produced and their potential as active-packaging material to minimize microbial growth in food products was assessed. The focal plane array - Fourier transform infrared imaging microspectroscopy was employed for the first time to examine the spatial distribution of all film ingredients, as well as to monitor the antimicrobial diffusion in the films subjected to different humidity levels. The films showed antimicrobial activity against MRSA (methicillin resistant *S. aureus*) and MSSA (methicillin sensitive *S. aureus*), but promoted growth of VRE (vancomycin resistant *enterococcus*). The oregano extract was the most effective natural antimicrobial against all three types of Gram positive bacteria, but when incorporated into the edible films, did not show effective diffusion to create zones of inhibition.

**AN ATLAS IN PANAMA: BUILDING LONG-TERM METHODS AND PRACTICES OF RESEARCH COLLABORATION BETWEEN THE INDIGENOUS NGÖBE AND BUGLÉ CONGRESO (COUNCIL) OF NORTHERN VERAGUAS, PANAMA AND MCGILL UNIVERSITY RESEARCHERS**

**Tulk, Pierre**

**Supervisors:** Prof. Caroline Begg, Department of Plant Science; Prof. Daviken Studnicki-Gizbert, Department of History and Classical Studies

This research project comes as the third stage of an ongoing collaborative initiative between the researchers of McGill and members of the Ngöbe and Buglé indigenous groups in Panama. The overarching objective was to develop cartographic skills among members of a traditional organization (*Quibian-Nune Köre-Toi Gnätaklne*) in the community. More specifically, the project looked into training the local peoples on research methodologies relevant to mapping and analyzing land use, food security, and potential areas of conservation zoning through the process of a participatory regional mapping exercise (Atlas). This phase of the project looked into the correction, edition and dissemination of this atlas and its usefulness for the people. This document will be used to assess local patterns of land use and then use these findings along with community consultations for the development of conservation policies.

**TIME TO MOVE: ENVIRONMENTAL DRIVERS OF WOOD BISON MOVEMENT AT MULTIPLE SCALES**

**Yaffy, Dylan**

**Supervisor:** Prof. Murray Humphries, Department of Natural Resource Sciences

Advancements in wildlife tracking technologies have led to many studies on animal movement in space, but very few on animal movement in time. Here, we use a large boreal herbivore, the wood bison (*Bison bison athabascae*), to illustrate how environmental temperature and photoperiod can influence movement at annual and daily time scales. The hourly GPS locations of 18 wood bisons were used to compute the average distance moved per hour and per day for all individuals measured. These distances were matched with ambient temperatures and sunlight hours. We demonstrate that distance moved per day is highest in summer when temperatures are high and days are long and that hourly movement is matched with the coldest part of the day when it is warm, but with the warmest part of the day when it is cold. These results highlight the complexity of the temporal relationship between wildlife movement and the environment.