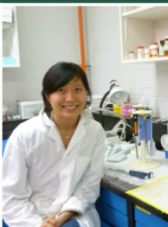
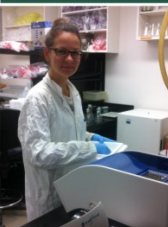
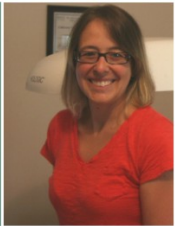




 **McGill**
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 RESEARCH AWARD (USRA)
 POSTER PRESENTATIONS**
 Wednesday, September 5, 2012
 16:00 - 18:00
 MACDONALD-STEWART MS2-022
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OPTIMIZATION OF A RUBBER ROLLER MILL FOR LITTLE MILLET (*PANICUM SUMATRENSE*)

Rebecca Chin, Bioresource Engineering

Supervisor: Prof. Valérie Orsat

Award: NSERC

Little millet (*Panicum sumatrense*) is a staple food grain of many regions in India that has an outer hull which must be removed prior to consumption. A rubber roller mill was designed and prototyped to achieve this goal of de-hulling. The de-hulling efficiency of the mill was tested; known masses of little millet, CO(SA)4 variety, were passed through the mill and the resulting fractions were sorted. The spacing between the rubber rollers, which is regulated by an eccentric pulley on one of the rollers, was adjusted and measured with a Feeler gauge in order to optimize the de-hulling efficiency. The optimal spacing of the rubber rollers for CO(SA)4 was determined to be 0.356mm. The rubber roller mill was compared with the existing emery mill in terms of efficiency and electricity requirements. The rubber roller mill has been accepted at the village level and is now being used.

EXPRESSION OF *BRACHYPODIUM DISTACHYON* COLD RESPONSE PROTEINS

Rachel Dionne, Plant Science

Supervisor: Prof. Jean-Benoit Charron

Award: NSERC

Many temperate cereal crops develop freezing tolerance when exposed to low, non-freezing temperatures, through a molecular pathway involving the induction of cold-regulated (COR) genes. The promoters of these genes contain a sequence that is bound by C-repeat Binding Factor 1 (CBF1) under cold stress conditions. Recently, CBF1 was demonstrated to interact *in vivo* with ADA2, a member of the chromatin-modifying SAGA complex. In this project, we successfully cloned *Brachypodium distachyon* CBF1, ADA2, and TIL genes into vectors to express recombinant proteins with specific tags that can be recognized with antibodies or used for affinity chromatography separation. These recombinant proteins will be useful tools for pull-down assays, crystallography studies, and the generation of antibodies.

ESTABLISHING STUDY SITES FOR LONG-TERM RESEARCH ON THE ECOLOGY OF EASTERN CHIPMUNKS

Amanda Droghini, Natural Resource Sciences

Supervisor: Prof. Murray Humphries

Award: NSERC

This summer, in Quebec's Réserve naturelle des Montagnes-Vertes, I participated in establishing three study sites for research on the ecology of the Eastern Chipmunk. Our main objective this year was to capture, handle, and individually mark all of the individuals on the three sites to get an idea of population density and population structure (i.e. age and gender distribution). Secondary tasks included conducting vegetation samples, open field experiments to assess personality, and installing radio-collars to locate chipmunk burrows. This summer experience is part of a larger scale, collaborative project between McGill University, l'Université de Québec à Montréal (UQÀM), and l'Université de Sherbrooke that is looking at the links between energetics, metabolism and personality.

BEHAVIOR AND SURVIVAL OF *LEGIONELLA PNEUMOPHILA* IN A DEFINED WATER MEDIUM

Paulina Dudyk, Natural Resource Sciences

Supervisor: Prof. Sébastien Faucher

Award: NSERC

Legionella pneumophila, is the causative agent of Legionnaire's disease, a pneumonia like infection in humans. *Legionella* is found in any natural or human-made water system. Transmission to humans occurs through inhalation of contaminated water droplets. Hence, survival and replication of *Legionella* in the water system is a pre-requisite for human infection. However, the molecular basis of *Legionella* survival in water is poorly understood. The goal of this study is to identify genetic determinants underlying the capacity of *Legionella* to survive in water. We have screened a variety of regulators for this phenotype. The sigma factor RpoS seems to be essential for long-term survival in water. To elucidate the genes misregulated in the *rpoS* mutant, we have performed microarray experiments. It seems that the *rpoS* mutant is unable to down regulate a number of genes, which may results in a waste of resources and therefore a reduction in survival.

α -CHYMOTRYPSIN-HYDROLYZED PEPTIDES FROM DOGFISH SKINS: A NATURAL ANTIOXIDANT

Marika Houde, Food Science and Agricultural Chemistry

Supervisors: Saranya Rajendran, Graduate student
and Prof. Benjamin K. Simpson

Award: NSERC

Studies are showing that synthetic antioxidants at high concentrations are linked to liver problems and carcinogenic effects in animal models, leading to their controlled use worldwide. In this context, certain protein hydrolysates and peptides from food materials have been investigated and shown to exhibit antioxidative effects. Protein hydrolysates were prepared from dogfish skins by α -chymotrypsin-assisted hydrolysis. The hydrolysates were investigated for antioxidant effects via superoxide anion radical scavenging, hydroxyl radical scavenging, reducing power and pro-oxidant metal ion chelating assays. It was concluded that α -chymotrypsin-derived hydrolysates from dogfish skins possess significant antioxidant activity in terms of free radical (superoxide and hydroxyl) scavenging, reducing power and pro-oxidant metal ion chelation. Further studies are required to provide additional information needed to justify the use of these extracts as suitable natural replacements for synthetic antioxidants.

MEASURING BODY COMPOSITION IN OVERWEIGHT AND OBESE 7-12 YEAR OLD CHILDREN: DUAL-ENERGY X-RAY ABSORPTIOMETRY VS. BIOELECTRICAL IMPEDANCE ANALYSIS

Kallopie Kasvas, Dietetics and Human Nutrition

Supervisor: Prof. Hope Weiler

Award: CIHR

The objective of this project was to compare differences in measurements of body composition by dual-energy X-ray absorptiometry (DXA) and foot-to-foot bioelectrical impedance (BIA) in overweight and obese children. 55 overweight or obese children (28 girls and 27 boys) ranging from 7-12 years old underwent a full-body DXA scan and two BIA measurements (one standard and one athletic). Bland-Altman tests show a low level of agreement between DXA and BIA-S for %BF ($\delta=0.557$, $\delta+2SD=9.192$, $\delta-2SD=-8.080$). However, a mixed model ANOVA analysis found no significant difference in %BF between DXA and BIA-S among 6-9 year-old children (41.2 ± 2.6 and 39.6 ± 2.6 , $p=0.1$) nor 10-12 year-olds (44.7 ± 3.5 and 46.0 ± 3.5 , $p=0.6$). Conclusion: BIA can be used in a clinical setting to assess body composition in overweight and obese children.

DIETARY SOURCES OF ADDED SUGAR IN HIGH RISK QUEBEC YOUTH

Kelly Light, Dietetics and Human Nutrition

Supervisor: Prof. Katherine Gray-Donald

Award: CIHR

The objective of this study was to describe the sources of added sugar in the diets of Quebec youth. Subjects were 613 children from 8 – 10 years of age living within 75 km of Quebec, Montreal and Sherbrooke with at least one obese parent. Three 24h recalls were performed for each child and the main categories of food contributing to added sugar intake were determined. These were: Baked Desserts, Fruit Drinks and Cocktails, Confectionary, Sweeteners and Frozen Desserts. Sugar intake was higher at meals than at snacks and intake increased throughout the day with the highest levels in the evening. Total sugar provided 26.0 % of kcal and added sugar provided 12.0 % of kcal. Quebec children consume more total and added sugars than recommended by the IOM, the AHA and the WHO. The top sources of added sugars are items which are consumed in adjunct to meals, such as desserts and sweetened beverages.

CHARACTERIZATION OF PUTATIVE MITOCHONDRIAL PROCESSING PEPTIDASE α -SUBUNIT IN *TRYPANOSOMA BRUCEI*

Ivy Mak, Parasitology

Supervisor: Prof. Reza Salavati

Award: NSERC

Trypanosoma brucei, the causative agent of African sleeping sickness, contains a single mitochondrion which imports proteins responsible for RNA editing process in this organelle. Here, using RNA interference (RNAi), we characterize the putative mitochondrial processing peptidase α -subunit (MPP- α), believed to cleave mitochondrial import signal to aid protein import and maturation. RNAi led to severe growth inhibition with accumulation of pre-cursor proteins, indicating possible disruption of the import process. Consistent with the lack of protein maturation, an adverse effect on RNA-editing activity following RNAi was evidenced by a 2-8 fold accumulation in pre-edited mRNAs that encode electron transport chain components. These observations suggest that the proposed MPP- α in *T. brucei* is implicated in the protein import as reported in other species, and impair RNA editing at least indirectly. Ongoing work on identification of protein interacting partners would allow further elucidation of gene function.

BIOCHAR AS A MEDIUM FOR BACTERIAL GROWTH

Julien Malard, Plant Science

Supervisor: Prof. Donald L. Smith

Award: NSERC

It has been suggested, for some time, that biochar application to soils affects the microflora of these soils. One suggested possibility has been that the bacteria can reside in the porous structure of the biochar. The suitability of softwood biochar as a medium for bacterial growth was investigated at various combinations of temperatures and nutrient supplements. Bacterial survival was evident for the gram-negative bacterium *Escherichia coli* DH5 α , and some evidence also suggests good levels of bacterial reproduction and growth even without the addition of nutrients. DH5 α having more stringent nutrient preferences than other *E. coli* strains, this suggests that the softwood biochar employed may act as a microhabitat for bacteria of a wide range of nutritional requirements in agricultural fields, which may have interesting implications on the microbial ecology in biochar-amended agricultural areas.

SEX DIFFERENCES IN THE INTERACTIONS BETWEEN GENES AND NUTRIENTS

Dianna Marini, Dietetics and Human Nutrition

Award: CIHR

Supervisor: Prof. Luis Agellon

FABP2 is a fatty acid binding protein expressed in the small intestine. The FABP2A54T gene variant of the Pima Indians attenuates the expression of the FABP2 gene. Fabp2 deficient mice is an extreme model of FABP2 gene attenuation and reproduce features (T2 diabetes, obesity, fatty liver disease) of Pima Indians homozygous for the FABP2A54T gene. These mice also exhibit a sex dimorphic response to high fat diets; males experience weight gain and develop fatty livers while females do not. Analysis of metabolic parameters of Fabp2 deficient mice did not reveal differences between the sexes in terms of energy expenditure, activity, and substrate utilization suggesting that the sex dimorphic phenotype is not due to these parameters. Microarray analysis identified the pancreatic lipase gene as differentially affected by Fabp2 deficiency in males and females. Altered expression of this gene in enterocytes may change intestinal fatty acid metabolism possibly explaining the sex dimorphic phenotype.

EFFECTS OF LANDSCAPE STRUCTURE ON THE REGULATION OF INSECT HERBIVORY BY BIRDS

Thomas Nicole, Natural Resource Sciences

Supervisor: Prof. Christopher Buddle

Award: NSERC

Insect herbivory is a major process affecting nutrient input, plant health, productivity and competition between plants. Among the most important regulator of insect herbivory are insectivorous birds, insect predators and parasitoids. By restricting movement and dispersion across landscape as well as diminishing habitat quality, fragmentation can have important consequences for predators' ability to reduce herbivory. In this study we aim at determining if changes in herbivory levels due to forest fragmentation are top-down related. We set up a bird exclusion experiment on sugar maple saplings in patches of deciduous forest from the fragmented landscape of the Montérégie. We will discuss our results by comparing the arthropod community and leaf damage found in large connected forests as opposed to small isolated forests.

NITROGEN CYCLING IN FRAGMENTED FORESTS OF THE MONTÉRÉGIE

Katriina O'Kane, Natural Resource Sciences

Supervisor: Prof. Elena Bennett

Award: NSERC

Biodiverse, self-regulating ecosystems are essential for our livelihoods, as they provide us with a range of ecosystem services, such as water purification and food production. However, linkages between biodiversity, ecosystem services, and landscape structure remain poorly understood. This project is part of a broader initiative investigating the effect of forest fragmentation on biodiversity and ecosystem services. Here, we investigate the consequence of forest fragmentation patterns (size and isolation) on nitrogen cycling in forest soils. Nitrogen cycling is one of the most important biogeochemical cycles, influencing plant growth and development through the incorporation of nitrogen in amino acids, nucleic acids, chlorophyll, and carbohydrates. As such, it supports many other ecosystem services, and is a critical component of healthy ecosystems. This summer we sampled 24 forest fragments, of four distinct fragmentation patterns. This fall, we will conduct laboratory analyses to measure % nitrogen, ammonium, and nitrate concentrations to get quantitative results.

A COMPARATIVE STUDY OF SEASONAL GROWTH PATTERNS OF THREE SPECIES OF BIRCH

Emily Pickering Pedersen, Natural Resource Sciences
Supervisor: Prof. Jim Fyles

Award: NSERC

Each tree species is adapted to a certain set of climatic conditions and has a specific geographic range in which it thrives. The seasonal growth pattern of each tree species may be related to its distributional range. This research project examined the seasonal diameter growth patterns of paper birch, grey birch and yellow birch. The research was conducted in the Morgan Arboretum, Quebec, where these species grow in close proximity despite different distributional ranges. Paper birch exhibited a significantly greater growth rate decline over the summer compared to grey birch and yellow birch. This is consistent with the prediction that a northern species would grow better in cooler conditions and have a shorter growth period compared to more southern species. Nonetheless, all species exhibited similar responses to local weather events. This indicates the importance of both local weather and large scale climate in determining the seasonal growth patterns of trees.

ANALYSIS OF THE DIAMETER GROWTH RATE PATTERNS OF PAPER BIRCHES FROM DIFFERENT LATITUDES

Lisa Rosenberger, Natural Resource Sciences
Supervisor: Prof. Jim Fyles

Award: NSERC

Tree growth depends both on local factors, such as rainfall and temperature, and genetic factors, which are unique to each tree species. Since local factors vary across the range of a species, a species will often not grow the same way in all parts of its range. In this study, we look at the diameter growth patterns of paper birches (*Betula papyrifera*) that were planted in the Morgan Arboretum from seeds taken from many different latitudes within its geographic range. We attempted to find if the trees' diameter growth rate patterns responded more to local factors or if their growth rate depended instead on the genetic factors unique to the trees found in that particular latitude. The results show that all the trees responded more to local factors, particularly the amount of precipitation, regardless of where they originated.

BIOMASS COMBUSTION FOR GREENHOUSE CARBON DIOXIDE ENRICHMENT

Yves Roy, Bioresource Engineering
Supervisor: Prof. Mark Lefsrud

Award: NSERC

This research project aims to develop a scrubbing system able to recuperate the CO₂ release during biomass combustion. The scrubbing system installed on the chimney of the furnace was able to reduce CO level from 1100 to 10 ppm, NO from 45 to 8 ppm, SO₂ from 19 to less than 1 ppm and NO₂ was less than 0.5 ppm inside the whole system. Based on the Health Canada Guidelines, the gas released is close to meeting the requirements even before dilution in the ambient air of the greenhouse (1). There are two exceptions which are NO, that are 3 times the recommended value, and the particulates that accumulate in front of the catalyser. Even though more research needs to be done to solve the remaining two issues, considerable progress has been made toward a sustainable and cost effective method for greenhouse carbon dioxide enrichment.

GRADING WHEAT BY MACHINE VISION

Sara Tawil, Bioresource Engineering
Supervisor: Prof. Grant Clark

Award: NSERC

Wheat is graded by following a set of standard procedures that help in determining the quality of the wheat and are vital to its marketing. The development of an automated machine vision software package to help in grading wheat is very desirable as many of the currently used procedures are tedious and time consuming. Using a webcam, a low-cost kernel imaging software has been designed to capture coloured images of the wheat kernels and analyse them. Threshold based colour to binary image conversion was used for the detection of the grain kernels. The software succeeded in identifying kernels and determining their geometry (major/minor axis length, projected area) and also in calculating the thousand-kernel weight, which is a standard test used in the industry. The minor axis length distribution of a sample is of particular interest to the industry as it relates directly to the milling efficiency.

CHARACTERISTICS OF SOIL IN MONTREAL TREE PITS

Xiao Mei, Bioresource Engineering

Supervisor: Prof. Grant Clark

Award: NSERC

Urban trees in Montreal have to survive harsh environments, between soils polluted by de-icing salts and potentially toxic metals (PTMs) and heavy compaction due to human activity. However, trees provide important services to the city, beautifying the streets and improving both the air quality and a community's psychological well-being while reducing human energy consumption. The tree pits also act as bioretention cells, regulating the water flow and trapping salts and PTMs. The city invests two million dollars every year to replace street trees due to their relatively short lifespan. To understand the soil chemistry in urban tree pits, soil samples were categorized according to land use (commercial or residential), tree age, and soil organic matter content and analyzed for nutrient and heavy metal content. Trends determined using chemical analyses would help suggest changes to the soil used by the city in order to increase the lifespan of urban trees.

INTERRELATIONSHIPS AMONG SERUM RETINOL, RETINOL BINDING PROTEIN, CORTISOL, AND C-REACTIVE PROTEIN IN INFECTED PREGNANT PANAMANIAN WOMEN

Xu Ran, Dietetics and Human Nutrition

Supervisor: Prof. Kristine Koski

Award: NSERC

Vitamin A is an important micronutrient required for successful pregnancy. It is found as retinol in the blood, bound to retinol binding protein (RBP), a negative acute response protein. The indigenous Panamanian population is known to be highly susceptible to health problems, such as infections and micronutrient deficiencies, including vitamin A deficiency. The purpose of this study is to assess the interrelationships among the markers of infection and vitamin A status in pregnant Panamanian women. 184 indigenous Panamanian women in their second and third trimesters were enrolled. Blood samples were analyzed for retinol, RBP, cortisol, and C-reactive protein (CRP). Women with infections had significantly higher concentrations of cortisol and CRP along with lower concentrations of RBP. Marginal vitamin A status ($<1.05\mu\text{mol/L}$) or deficient vitamin A status ($<0.70\mu\text{mol/L}$) were also associated with higher concentrations of cortisol and CRP, and lower concentrations of RBP. This indicates that vitamin A status may have an effect on the maternal infection paradigm. Conversely, there may be a need to control for CRP and cortisol when assessing maternal vitamin A status.

INFANT VITAMIN D STATUS POSITIVELY AFFECTS WHOLE BODY BONE MINERAL CONTENT AT 3 YEARS OF LIFE

Krystyna Zhaorong Wang, Dietetics and Human Nutrition

Supervisor: Prof. Hope Weiler

Award: CIHR

Current vitamin D supplementation recommendation for infants is 400 IU/d. It is unclear whether higher dosage improves bone development at 3 years. The objective of this follow-up study is to determine if vitamin D status at infancy relates to bone health at early childhood. Healthy, breastfed infants (n=66) were randomized to receive 400, 800, 1200 or 1600 IU/d of vitamin D3 from 1 to 12 months. Serum 25-hydroxy vitamin D3 (25(OH)D) was measured using liquid chromatography tandem mass spectrometry, and bone masses were measured using dual-energy x-ray absorptiometry (DXA). No significant difference in 25(OH)D and anthropometric was observed among treatment groups. There were positive correlations between whole body bone mineral content at 3 years and serum 25(OH)D at 9 months ($r=0.33$, $P=0.014$) and 12 months ($r=0.30$, $P=0.020$) using ANOVA model and Tukey post test. Preliminary results suggest that infant 25(OH)D status can be an indicator of body composition during early childhood development.



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