2013

Irving K. Barber School of Arts and Sciences
8th Annual Undergraduate Research Conference
Thursday, April 4, 2013

ORAL PRESENTATION SCHEDULE & ABSTRACTS

IKBSAS Undergraduate Research Conference

Oral Presentation Schedule - Session 1 - Room ASC 271

Thursday, April 4, 2013

Session	First Name	Last Name	Presentation Title	Time
1	Samantha	Prevett	Subjective Well-Being and Personality Factors in People with Acquired Brain Injury	1:00 - 1:20
1	Lisa	Guidi	Invalidating Environments, Emotional Vulnerability, and Health Behaviours	1:20 - 1:40
1	Timothy	Krupa	Determining correlates of well-being in Zambian children	1:40 - 2:00
1	Aisha	Bhanwer	Vicarious Revenge: An Examination of Schadenfreude and the Dark Triad.	2:00 - 2:20
1	Karen	MacKay	“Selfless” care of the dying: A gendered analysis of volunteerism in Hospice Palliative Care	2:20 - 2:40
1	Ben	Atkinson	Examining the process of cannabis induced analgesia influenced by alterations of mood	2:40 - 3:00
1	Kiran	Lidher	Nutrient Limitation: The important of soil phosphatases in phosphorus acquisition by plants, fungi and microbes.	3:00 - 3:20
1	Tristan	Watson	Evaluation of rhizobacteria for biological control of fungal phytopathogens associated with apple replant disease	3:20 - 3:40

Subjective Well-Being and Personality Factors in People with Acquired Brain Injury

Student: Samantha Prevett

Supervisor: Dr. Mark Holder

Despite there being millions of Americans living with an acquired brain injury (ABI), research focused on the positive subjective well-being (SWB) of these individuals is very limited. The present study investigated the relationships between the Big Five personality factors and components of SWB (i.e., positive and negative affect, satisfaction with life, and happiness) in individuals with an ABI. Using individual interviews, a battery of questionnaires was provided to participants with ABI to assess their demographic information, spirituality, social relationships, and medical histories. Additionally, personality was assessed using Costa and McCrae's NEO-FFI, and SWB was assessed with multiple measures. Personality has been consistently shown to be one of the strongest predictors of the components of well-being in the general population of adults and children. In particular, neuroticism is negatively correlated with positive well-being and extraversion is positively correlated with well-being. Though research has shown that ABI is often accompanied by changes in personality, whether the relations between personality traits and SWB hold true for people with ABIs has not been fully explored. Understanding the correlates of SWB in those with an ABI is imperative to facilitate improvement in treatment settings, as well as in everyday life.

Invalidating Environments, Emotional Vulnerability, and Health Behaviours

Student: Lisa Guidi

Supervisor: Dr. Brian O'Connor

The purpose of our study is to investigate the role of invalidating environments and emotional vulnerability--two major components of the Biosocial Model of Borderline Personality Disorder—in relation to eating behaviours and exercising behaviours among university undergraduates. The current study expands on the previous research about the connection between invalidating environments, emotional vulnerability, and eating habits and seeks to extend this knowledge to include the relationship with peoples' exercise habits. Pearson correlations will be computed to assess the relationships between all of the variables. Hierarchical regression will then be used to assess the portions of variance in eating behaviours and exercising behaviours that are accounted for by invalidating environments and emotional vulnerability, both before and after the covariates of thought suppression and parental bonding are controlled. This research will provide more information about the interpersonal factors that are related to health outcomes. Additionally, it could help to identify additional areas to target when seeking to increase health and fitness and decrease maladaptive eating habits.

Determining correlates of well-being in Zambian children

Student: Timothy Krupa

Supervisor: Dr. Mark Holder

This study investigated the correlates of psychological well-being in 1365 children and adolescents in urban and rural communities in Zambia. Four different populations were sampled: 1) rural impoverished children from Lusaka (Lusaka Province); 2) rural affluent from Lusaka; 3) semi-rural impoverished from Senanga (Western Province); and 4) semi-urban impoverished from Livingstone (Southern Province). Participants completed a forty-five item survey. The survey included measures of psychological well-being (i.e., happiness, life satisfaction, and sense of hope), nature connectedness, spirituality, religiousness, and physical health. All surveys and instructions were translated into tribal languages, and read by interpreters to ensure participants' understanding. The measures of psychological well-being indicated that children and adolescents in Zambia were happy. Urban participants were more hopeful than rural participants, while rural participants were found to be happier than urban participants. Physical health correlated positively with all measures of psychological well-being. Nature connectivity, spirituality, and religiousness items are currently being analysed. This study was important to advance understanding of children's and adolescents' well-being. It has opened discussions on possible interactions, and variations in the meaning and importance of the sense of hope and happiness due to cultural perspectives. Further study and local interpretation of results may assist in designing culturally appropriate interventions in Zambia and potentially globally, to increase subjective well-being.

Vicarious Revenge: An Examination of Schadenfreude and the Dark Triad.

Student: Aisha Bhanwer

Supervisor: Dr. Stephen Porter, Dr. Michael Woodworth, and Pamela Black

The violent behaviour of psychopaths is partially attributed to their dysfunctional emotional processing, specifically a deficit in empathy and remorse (Hare, 1995; 2003). In particular, psychopathy is related to sadism, (e.g., pleasure from inflicting pain and suffering in others; Porter et al., 2003), likely because psychopathic perpetrators cannot empathize with their victims. Less severe in nature than sadism, but more commonly experienced by the general population is schadenfreude, pleasure derived from observing another's misfortune (Takahashi et al., 2009). Schadenfreude has only recently begun to be investigated, with a paucity of research examining the influence of personality factors on schadenfreude intensity. The current study examined the association between the Dark Triad (i.e., psychopathy, narcissism, and Machiavellianism), personality traits that share a core of emotional dysfunction, and schadenfreude. Schadenfreude was assessed using both overt (e.g., self-report) and covert (e.g., smiling) measures. Participants (N = 120) were randomly assigned to one of three conditions in which they read a vignette intended to induce an emotional state: empathy, schadenfreude, or neutral. Each participant then was exposed to an image of an unfortunate event involving the individual from the vignette. All participants were shown the same four images - two legal and two non-legal contexts - and completed a short questionnaire about his/her emotional reaction to the image. Finally, participants completed a number of personality measures to assess Dark Triad traits and empathy. High Dark Triad scores, psychopathy in particular, were positively related

to self-reported schadenfreude, and negatively related to empathy. Smile intensity did not differ significantly between the emotional conditions. Results of the self-reported schadenfreude suggest that schadenfreude intensity was higher for the legal stimuli than the non-legal stimuli. This supports previous findings that negative events paired with increased perceived deservingness (e.g., criminal behaviour; Van Dijk et al., 2005), elicits greater responses of schadenfreude.

"Selfless" care of the dying: A gendered analysis of volunteerism in Hospice Palliative Care

Student: Karen MacKay

Supervisor: Dr. Shelley Pachlock

Hospice Palliative Care (HPC) volunteerism provides an essential service to hospice clients, that of compassionate care. The purpose of this pilot study is to investigate the motivations for choosing HPC volunteerism and explores how these motivations relate to gendered discourses of care. Utilizing a gendered analysis I explore the motivations for choosing to volunteer in HPC and why it is that the majority of volunteers are women. The key themes to be explored are: i) what was the motivation(s) behind choosing HPC volunteerism; ii) how do motivations relate to benefits (personal, emotional etc.) that volunteers experience; and iii) what personality traits do volunteers see as being essential to HPC volunteerism. Individual interviews with both male and female HPC volunteers were utilized to illuminate the similarities and differences in motivations, benefits received and experiences of HPC volunteers. The concept of selfless care is utilized to critique how it is that individuals balance the emotional work of HPC with their desire to be of service.

Examining the process of cannabis induced analgesia influenced by alterations of mood

Student: Ben Atkinson

Supervisor: Dr. Zachary Walsh, Dr. Susan Holtzman, and Robert Kay

A robust literature attests to the effectiveness of cannabis for improving one's mood, and examining how this facilitates cannabis' effect on pain may elucidate some of the mechanisms for this interaction. Research has established the analgesic properties of cannabis, and the mood altering effects of cannabis are widely recognized. However, the role of mood alteration in the analgesic effects of cannabis has not yet been well characterized. The present study was designed to assess the reported effectiveness of cannabis in managing pain across levels of mood. In particular, levels of anxiety, depression, and pain catastrophizing were compared in a sample of medical cannabis users aged 19 and over, whom reported using cannabis in the treatment of pain. Researchers at the University of British Columbia- Okanagan are currently collecting data from participants who receive $20 for completing a battery of self-report questionnaires examining their motives for cannabis use, their pain, as well as their levels of depression, anxiety and pain catastrophizing. In addition, participants will be asked to complete measures of mindfulness and coping strategies with an expected 50-100 responses available for April. If participants

who suffer from mood disorders report significantly more effectiveness from cannabis than those who do not, it will provide a more thorough understanding of how cannabis' effect on mood relates to its effect on pain.

Nutrient Limitation: The important of soil phosphatases in phosphorus acquisition by plants, fungi and microbes.

Student: Kiran Lidher

Supervisor: Dr. Melanie Jones

Phosphorus is an example of an essential macronutrient for plant and other organisms. For this reason, there is a huge demand for phosphorus; however, the majority of phosphorus in soil is inaccessible to plants. Therefore, plants depend on the action of various decomposers, like fungi and bacteria, to release exoenzymes, known as phosphatases. Phosphatases break down organic compounds to release orthophosphate, a form of phosphorus that can be absorbed by plants. In this study we measured acid phosphatase activity *in situ* using a novel fine-scale imprinting technique. This technique allowed us to study activities at very fine scales, which is often very difficult to achieve. In an earlier study, higher carbon and nitrogen were found in soil microsites exhibiting higher phosphatase levels. In my study, I tested the hypothesis that carbon and nitrogen limit the ability of soil bacteria and fungi to grow and excrete phosphatases. For my *in-situ* experiment, five different treatments were injected into root windows at a mixed paper birch – Douglas-fir site near Mabel Lake, British Columbia: (i) water (ii) 417 mmol/L cellulose suspension (iii) 417 mmol/L chitin suspension (iv) 417 mmol/L collagen suspension and (v) 417 mmol/L ammonium chloride plus sodium acetate suspension. Preliminary results using mean intensity values per window indicated that addition of chitin increased phosphatase activity compared to water controls. The addition of cellulose had the least effect on phosphatase activity. The same imprinting technique was used to measure acid phosphatase activity in homogenized soil returned to the lab. Results of the lab study and of microbial biomass determinations using the chloroform fumigation-incubation techniques on high phosphatase and low phosphatase micro soil samples will also be discussed. Understanding and determining the way phosphorus is cycled in forests is important for understanding nutrient supply to trees and how forest management may affect this.

Evaluation of rhizobacteria for biological control of fungal phytopathogens associated with apple replant disease

Student: Tristan Watson

Supervisor: Dr. Louise Nelson

Apple replant disease (ARD) is responsible for the decrease in orchard productivity that is observed when apple seedlings are grown in soil that has previously been used for an apple orchard. Recent restriction on the use of chemical fungicides to control the assorted fungal pathogens associated with ARD is generating interest in the use of microbial biological control agents (BCAs). In this study, twenty---six bacteria isolated from Saskatchewan soil were evaluated for antagonistic activity toward

Rhizoctonia, Cylindrocarpon, *Fusarium*, and *Phytophthora spp.* using a dual culture *in vitro* screening method. Results indicated that *Pantoea agglomerans* 6---20 and *Pseudomonas syringae* 2---28 both had high overall antagonistic activity toward the various fungal pathogens examined. Plant growth experiments using *P. agglomerans* 6---20 as a microbial inoculant indicated that this prospective BCA was only capable of alleviating disease symptoms caused by *Cylindrocarpon sp.*. The use of *P. syringae* as a microbial inoculant resulted in a decrease in plant growth, suggesting the production of plant growth reducing compounds by this bacterial isolate. Neither prospective BCA was capable of suppressing disease symptoms as a result of seedlings being planted in organic replant soil. Root colonization experiments were performed to examine the ability of both bacterial isolates to persist on the rhizosphere of apple seedlings. Overall, *P. agglomerans* 6---20 shows the greatest potential for future development into a BCA to mitigate ARD symptoms.

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Oral Presentation Schedule - Session 2 - Room ASC 273

Thursday, April 4, 2013

Session	First Name	Last Name	Presentation Title	Time
2	Andrew	Moldovan	Statistical Data Mining Applications in Student Learning	1:00 - 1:20
2	Eric	Wein	AutoEd 2.0: An Online Courseware and Motivation System	1:20 - 1:40
2	Eric	Koch	Converging Flows in Star Forming Regions	1:40 - 2:00
2	Michelle	Sawatsky	Cooling Below 1 K: Adiabatic Demagnetization of a Paramagnetic Salt	2:00 - 2:20
2	Tyler	Berg	A Catalog of Supernova Remnants in M31	2:20 - 2:40
2	Paul	Moore	Multiplayer Math on the go with Factor Friends: Making Math and Computer Science Concepts Fun Again with Social Mobile Games	2:40 - 3:00
2	Rodney	Earl	Visualization of 4D Functions	3:00 - 3:20
2	William	Lee	Fast Grid-based Path Finding for Video Games	3:20 - 3:40
2	Cody Derrick	Clerke Pelletier	Managing City of Kelowna Parks to Improve Sustainable Water Use	3:40 – 4:00

Statistical Data Mining Applications in Student Learning

Student: Andrew Moldovan

Supervisor: Dr. Ramon Lawrence

With the advent of online education, an abundance of information has become available for study and analysis. An online system has been used for first Year Physics classes at UBC Okanagan allowing professors to assign quizzes and assignments for students to complete online. Student answers were given in the form of natural language text and evaluated by a parser which would return whether or not the student was correct. While this system had been in use for over two years, it had never been properly analyzed. This project had two goals: first, to create a tool which professors could use to understand how their students are faring in real time by providing them a collection of charts, alerts, and statistical information (the Dashboard). Second, to analyze the aggregate data derived from the students to better understand how students learn. To accomplish this goal, computer code was written to parse and interpret each and every incorrect answer to understand where the student went wrong in answering the question. The Dashboard has been fully implemented and is in use by professors of first year Physics classes, who can already use the system to change their assignments and quizzes as suggested by the alerts. Analyzing these statistics has provided insights on student achievement on assignments, when students are most likely to start and finish an assignment, and on the quality of questions in assignments. The long-term goal is to improve the quality of the questions and student achievement.

AutoEd 2.0: An Online Courseware and Motivation System

Student: Eric Wein

Supervisor: Dr. Ramon Lawrence

AutoEd 2.0 is a web based courseware system with an integrated user profile system that allows students to complete assignments and tests online. The system was developed to be a remodeling of a previous system (AutoEd) to include a better user interface along with a points and badge system to keep students motivated. Each student upon registration is given a profile page where they can set goals, rate courses, view recommended courses and earn various badges. Students are also awarded points for their achievements whether it be obtaining a new badge or achieving an A on a test. As students earn points they go up in level to further award the more motivated students. The system was designed using various methods to keep the system modularized and easy to expand and build upon. This presentation will demonstrate how the system makes it easier to motivate students to complete assignments.

Converging Flows in Star Forming Regions

Student: Eric Koch

Supervisor: Dr. Erik Rosolowsky

A prominent question in current star formation research is the source of cluster mass. It is generally accepted that stars, including the Sun, form in clusters. However, previous research has shown the masses of proto-clusters are less than expected. Converging flows are a proposed method in which these clusters gain significant mass from surrounding filamentary structure. Signatures of these flows are difficult to detect and previous research has been based primarily on by-eye analysis. I have developed a new method which algorithmically detects and characterizes converging flows in data sets.

The signatures of converging flows were first examined in simulated data sets created using ENZO, a fluid simulation code. Simulations represent an idealized situation where all of the information is known. Converging flows in the simulated data were detected by finding regions of extreme negative divergence in the velocity. This relies on complete knowledge of the velocity, something which cannot be known in observations. Mock observational data was created from the simulation data set to mimic two dense gas traces, ^{13}CO and HCO$^+$. I found that features with large gradients in the velocity centroid surface corresponded well to regions of negative divergence. To trace these regions of converging flows, I used a 2D Legendre Fit which has the benefit of being robust due to orthonormality between each order. I applied this method to observational data of the B1 star forming region using the same dense gas tracers as for the simulation data. Using a filament detecting algorithm I had previously developed, I was able to limit the search for converging flows to only areas of interest. In this way, I measured the converging flows in the B1 image robustly using only a computational algorithm. This method allows large data sets to be analyzed quickly and efficiently for converging flows.

Cooling Below 1 K:
Adiabatic Demagnetization of a Paramagnetic Salt

Student: Michelle Sawatsky

Supervisor: Dr. Jake Bobowski

In physics, both theoretical and experimental studies of the low-temperature properties of materials have led to many astonishing discoveries. Superconductivity, superfluidity, and Bose-Einstein condensation are all examples of low-temperature phenomena in which the quantum nature of materials are dramatically revealed in their macroscopic behaviour. By using a pump to reduce the vapour pressure above a liquid helium-4 bath, temperatures as low as 1 K can be reached relatively easily. The most common way to access temperatures significantly below 1 K is by using a dilution refrigerator. However, these fridges can be costly to operate both in terms of helium consumption and time. As a result, cooling by the demagnetization of a paramagnetic salt, which was developed decades before dilution refrigeration, has seen a resurgence in niche applications. This method exploits the dependence of the entropy of the salt, which can be treated as a collection of independent magnetic

dipoles (or spins), on temperature and an externally applied magnetic field. In particular, if a field is isothermally applied to the salt, the spins align resulting in a decrease in the entropy. Next, the salt is thermally isolated from its surroundings using a heat switch and the applied magnetic field is reduced. During this process, the temperature of the paramagnetic salt decreases in proportion to the magnetic field and temperatures below 100 mK can be reached and maintained. This presentation will describe our design and experimental tests of an adiabatic demagnetization refrigerator (ADR) based on a ferric ammonium alum (FAA) salt "pill" and a heat switch made from a column of superfluid helium-4. In its final implementation, the ADR will used to extend the temperature range of the suite precision microwave experiments used by the Superconductivity group at the University of British Columbia.

A Catalog of Supernova Remnants in M31

Student: Tyler Berg

Supervisor: Dr. Erik Rosolowsky

The closest large spiral galaxy to our own, Andromeda, also known as M31, is one of the most comprehensively studied galaxies in the Universe. A portion of the observational data deals with H II ions, otherwise known as H+, because the emission spectrum from this ion is one of the best indicators available for active star formation, and so is the most common tracer for star formation outside our own galaxy. This paper deals with the creation of a catalog of H II emission regions in M31. Within each of these H II regions, the amount of S II emission flux was measured. S II emission can only occur in a supernova remnant, which is the structure of the leftover gas of a massive-star supernova. Thus, by comparing the ratio of S II flux to H II flux, these regions can be separated into two classes: photoionization (HII) regions, and supernova remnants (S II regions). Using the total flux and size of each of the objects in the supernova remnant catalog, along with their position within M31, the rate of supernovae events can be estimated for different regions in the galaxy.

Multiplayer Math on the go with Factor Friends: Making Math and Computer Science Concepts Fun Again with Social Mobile Games

Student: Paul Moore

Supervisor: Dr. Ramon Lawrence

One in every five kids under the age of five can operate a smartphone. By the time they reach age 17, there is a 58% chance they will own one. However, over one fifth of the same children fail at basic numeracy and arithmetic. Pocket-sized computers are another distraction to students, both in and out of the classroom. The solution is not less technology in the classroom, but more of it. Mobile devices have proven to be great tools for entertainment and social networking, but now it is education's turn. I have created an iPhone application which applies elements

of game theory in a game designed to teach arithmetic. Factor Friends makes learning core Math and Computer Science concepts an engaging, multiplayer competition. By integrating social networking, Factor Friends becomes a shared learning experience for peers. The game also pairs opponents together who best match each other's skills, which provides a natural learning curve and level progression. Gamification is used to not only turn Math into a game, but make it an integral part of the experience while keeping it fun. Concepts such as precedence, association, and reduction are the keys to earning more points, achievements, and even user discovered content.

Visualization of 4D Functions

Student: Rodney Earl

Supervisor: Dr. Yves Lucet

Pictures have always been great ways to help us understand many complex and abstract ideas, but what do we do when what we want to see them in 4 dimensions? Visualizing complex objects is a critical component in our strive to advance in our knowledge based society. In our search to learn more, we are constantly making new, more advanced visualization tools, so we can view the geometry of molecules for pharmaceutical research, real-time analysis of computer networks and understanding social networks. Unfortunately, our standard visualization techniques are limited to 3 dimensions. We propose a new visualization technique for an important family of multi-valued functions, named monotone operators, arising from the field of optimization. This technique takes advantage of the special structure of these operators that lets us understand their structure through simple colourings. This talk will demonstrate our technique and present preliminary results.

Fast Grid-based Path Finding for Video Games

Student: William Lee

Supervisor: Dr. Ramon Lawrence

As video games evolved throughout the ages, the demand for computational power to handle their complexity has increased. In games of the current generation, it is not uncommon for hundreds of agents to be path finding simultaneously, yet the amount of time dedicated to path finding has not substantially increased. As a result, compromises such as reducing the quality of paths are made, which often results in some inhuman like behaviors in computer units. This work constructs a new path finding algorithm called DBA*, which combines the best features of two state of the art path finding algorithms. By using a sector based map abstraction in combination with a subgoal database pre-computed using dynamic programming, DBA* improves upon current algorithms on multiple different measures such as optimality, computational time and memory usage. All algorithms were evaluated on standard benchmark maps from Dragon Age: Origins™ available at http://movinggai.com. Although the DBA* algorithm is specifically designed and optimized for grid-based path finding, it is potentially adaptable to general heuristic search and planning.

Managing City of Kelowna Parks to Improve Sustainable Water Use

Student: Cody Clerke and Derrick Pelletier

Supervisor: Dr. Ramon Lawrence

Kelowna is committed to sustainability and effective use of its water resources. The primary focus of our project is to provide the City of Kelowna's Parks Department Office with an easy-to-use web interface that allows them to visualize and manage all of their irrigation-related data in one place. This data consists of locations of irrigation zones and irrigation equipment on site, watering schedules, and historical water usage. This system will provide its users with accurate maps displaying GPS locations of sites and equipment, current and historical watering schedules, and charts showing monthly water usage by site or groups of sites. Users will also be able to generate reports to discover which sites use the most water. Having all of this data organized and clearly presented will allow parks managers to better allocate their limited resources to reduce water usage and to make a positive impact on sustainability in our city.

IKBSAS Undergraduate Research Conference

Oral Presentation Schedule – Session 3 - Room FIP 247

Thursday, April 4, 2013

Session	First Name	Last Name	Presentation Title	Time
3	Clayton	Lamb	SNP discovery and validation in the American pika reveals population structure among elevational transects at their northern range periphery	1:00 - 1:20
3	Sarah	Smith	Yeast communities of Pinot noir grapes at Quails' Gate Estate Winery.	1:20 - 1:40
3	Connie	Leung	A novel approach to increasing the nutritional value of tomatoes using arbuscular mycorrhizal fungi (AMF).	1:40 - 2:00
3	Meg	Sharpe	Modelling the impacts of global climate change on the North American gyrfalcon (*Falco rusticolus*)	2:00 - 2:20
3	Kristina	Vallance	Meadow Vole Foraging in Response to Risky Habitat	2:20 - 2:40
3	Jenna	Gall	Land use changes in the Similkameen River watershed.	2:40 - 3:00
3	Rhiannon	Wallace	Biocontrol of postharvest disease on d'Anjou pears using Pseudomonas fluorescens isolates 4-6 & 1-112	3:00 - 3:20
3	Erin	Faasse	Yeast dynamics during inoculated and spontaneous fermentations at a British Columbia winery	3:20 - 3:40
3	Laura	Feeny	The occurrence of yeasts in air and on surfaces of a British Columbia winery before and after grape arrival and commercial yeast handling	3:40 - 4:00

SNP discovery and validation in the American pika reveals population structure among elevational transects at their northern range periphery

Student: Clayton Lamb

Supervisor: Dr. Michael Russello

Species are currently facing unprecedented rates of climate change, which has presented novel selection pressures. In response to such rapid climactic changes, species can shift their current range to more suitable environments, adapt *in situ,* or perish. The American pika (*Ochotona princeps*) is a temperature-sensitive, dispersal-limited small mammal that presents an ideal organism to study species-level adaptation in a changing climate. To investigate adaption in the American pika, I characterized 21 single nucleotide polymorphism's (SNPs) within the protein-coding region of the pika genome. An initial test showed that all 21 SNPs were variable among samples collected along an elevational gradient in Bella Coola, BC, with 17 SNPs showing patterns of allelic fixation at either the high or low elevation sites. DNA sequence similarity searches revealed one locus that was of particular interest: NADH dehydrogenase 5 (ND5) of the mitochondrial genome. ND5 is a functional enzyme in the respiratory chain during oxidative phosphorylation, and plays a central role in energy metabolism. In order to examine the patterns of ND5 variation, 55 Bella Coola pika from three elevational transects (ranging from 0-1500m) were sequenced, revealing five distinct haplotypes and five variable SNPs. Estimates of haplotype diversity and analyses of molecular variance revealed that the genetic variation at this locus was distributed among transects, rather than between elevations. The geographic distribution of genetic variation likely means this locus is not under directional selection, but suggests that ND5 may constitute a valuable marker for investigating population structure and demographic history in this system.

Yeast communities of Pinot noir grapes at Quails' Gate Estate Winery.

Student: Sarah Smith

Supervisor: Dr. Daniel Durall and Dr. Janet Kluftinger

While *Saccharomyces cerevisiae* is the primary yeast responsible for alcoholic fermentation, the literature recognizes many other yeast species that are present throughout fermentation. Along with *S. cerevisiae*, non-*Saccharomyces* yeasts may play an important role in influencing the flavour and aroma of wine. Recent evidence indicates that species and strains that occupy the vineyard and winery can be part of the yeast communities found in both spontaneous and inoculated fermentations. The objective of this study was to isolate and identify non-*Saccharomyces* species and *S. cerevisiae* strains that live in and on the grapes in the vineyards of Quails' Gate Estate Winery. During the 2012 vintage and prior to their harvest, grapes were aseptically removed from three blocks of *Vitis vinifera* L. var. Pinot noir vines planted in 2005, and three blocks of vines planted in 1990. The grapes from each of the six blocks were sampled at four stages (skin, crushed juice, and twice during a small-scale spontaneous fermentation). *S. cerevisiae* strains were identified by comparing DNA fingerprints to a microsattelite ADY commercial database. Non-*Saccharomyces* species were identified upon sequencing the D1/D2 regions of

rDNA and comparing the results to the NCBI database. The skin and juice of the grapes contained only non-*Saccharomyces* species. One out of six samples successfully completed fermentation. Two *S. cerevisiae* strains were identified from the completed fermentation. In comparing the yeast communities of the winery to those found throughout alcoholic fermentation, winemakers are able to use this data to better understand how yeast communities of the vineyards contribute to the winemaking process.

A novel approach to increasing the nutritional value of tomatoes using arbuscular mycorrhizal fungi (AMF).

Student: Connie Leung

Supervisor: Dr. Miranda Hart and Dr. Susan Murch

With the growing interest in fortifying and enhancing the nutritional value in our foods, there is increasing pressure to find novel ways to increase the nutritional content in our food. Rhizophagus irregularis, an arbuscular mychorrhizal fungi (AMF), is widely used as a commercial fertilizer to increase the nitrogen and phosphorus availability in soils subsequently improving plant yield. Despite its potential, few studies have been conducted on the toxicology, and the mineral and phenolic contents of foods associated with AMF, particularly with respect to important human nutrients. Here, we examined the effect of 2 AMF (Rhizophagus irregularis or Funneliformis fragilistratus) alone or a combination of both on antioxidant potential, volatiles, lycopene and mineral content of AMF associated tomatoes in two experiments. Preliminary data suggests that AMF inoculation increases antioxidant potential and lycopene content in tomato compared to uninoculated plants. AMF also has implications on minerals and volatiles in the tomatoes. This research indicates that AMF inoculation of food crops may be a new way that growers can use to increase the nutritional density in foods. This can have further applications for food security and creating nutrient dense foods for populations where food availability is inconsistent and also for sustainable agricultural practices.

Modelling the impacts of global climate change on the North American gyrfalcon (Falco rusticolus)

Student: Meg Sharpe

Supervisor: Dr. Karen Hodges

The gyrfalcon (Falco rusticolus) is a large falcon that spends most of its life north of the Arctic Circle. A number of arctic species are already negatively affected by global climate change. Many arctic species, the gyrfalcon included, are not well studied and important information about how this species will react in the face of climate change may be missing. I compiled data on the survival and reproduction of each age group and diet of the North American gyrfalcons from the primary literature. These data were used to develop population models and run scenarios to

project the changes in gyrfalcon populations as a response to the effects of climate change. I found that adult survival has the greatest effect on the population size and juvenile survival has the least. The gyrfalcon will eat a variety of birds and small mammals but have a strong preference for ptarmigan (Lagopus spp.). My results indicate that the effects of climate change could negatively impact gyrfalcon populations, causing population declines.

Meadow Vole Foraging in Response to Risky Habitat

Student: Kristina Vallance

Supervisor: Dr. Karen Hodges

An animal has to decide where to forage. For small prey species, the decision is oftenbased on predation risk and the safety each habitat provides. Predation risk can be decreased by vegetation cover and different light levels for nocturnal animals. I tested the hypothesis that voles would prefer increased amounts of vegetative cover as well as low light levels (ie. the new moon rather than the half or full moon). I worked on the University of British Columbia Okanagan campus near Roberts Lake. I used foraging trays, filled with sand and sunflower seeds, to measure how many seeds a meadow voles (Microtus pennsylvanicus) would leave behind as a quantity of how safe they feel in that environment. Voles ate more sunflower seeds in increased vegetative cover as well as during the half moon. They also forage more during the new or full moon when shrubs were present, and did not forage at sites with steeper slopes. These results show that volesfeel safer when there is cover present and the moon is in between moon phases.

Land use changes in the Similkameen River watershed.

Student: Jenna Gall

Supervisor: Dr. Adam Wei

Understanding land use changes within a watershed is crucial for managing natural resources and protecting watershed function. The Similkameen River watershed (7600km^2) located in the South Okanagan of British Columbia has been subject to changes in mining, forestry, agriculture and urban development in the past. Very little research has been done to determine what land use changes have occurred in this watershed. This study looks at the land use changes that have occurred in the Similkameen River watershed in the past, what is occurring now and what changes may occur in the future. It was determined that significant changes have occurred in the past, but land use change has been relatively stable over the past 20 years. However, it can be predicted that land use changes such as forestry, agriculture and mining will be intensified under future climate change and human population increase. The possible implications of these land use changes on water resources and other watershed functions are discussed.

Biocontrol of postharvest disease on d'Anjou pears using Pseudomonas fluorescens isolates 4-6 & 1-112

Student: Rhiannon Wallace

Supervisor: Dr. Louise Nelson

The production of d'Anjou pears (Pyrus communis) is a complex process involving the orchard, storage, and marketing phases. Postharvest disease is a serious issue faced by orchards around the world and specifically is an increasing problem locally for the Okanagan Tree Fruit Cooperative. The three fungal pathogens, Penicillium expansum, Botrytis cinerea, and Mucor piriformis, have been found to commonly infect pears in the Okanagan. Over the past 70 years chemical pesticides have been applied extensively to crops to reduce postharvest loss, but pathogen resistance to the pesticides is emerging. This has led to increasing research for safer alternatives such as the use of biocontrols. Since most alternatives to chemicals do not provide a broad spectrum of activity we studied the efficacy of Pseudomonas fluorescens isolates 4-6 and 1-112 in combination with sodium bicarbonate in preventing fungal growth on inhibition plates. The bacterium P. fluorescens isolates used in this study were isolated from the rhizosphere of pulse crops in Western Canada. It was observed, in vitro, that the application of 0.1% or 0.5% sodium bicarbonate in combination with P. fluorescens was effective at inhibiting the growth of B. cinerea, P. expansum, and M. piriformis. In addition, this study examined the efficacy of P. fluorescens isolates 4-6 and 1-112 in preventing disease in d'Anjou pears during cold storage, controlled atmosphere storage and after controlled atmosphere storage. In cold storage, P. fluorescens was effective in controlling disease at 4 and 8 weeks. In controlled atmosphere storage, no significant levels of control were observed. Finally, when pears were inoculated after controlled atmosphere, control against B. cinerea was observed. These results suggest that P. fluorescens has the potential to effectively control common postharvest pathogens, particularly when inoculation occurs after controlled atmosphere storage. The addition of sodium bicarbonate may enhance efficacy and requires further testing in vivo.

Yeast dynamics during inoculated and spontaneous fermentations at a British Columbia winery

Student: Erin Faasse

Supervisor: Dr. Dan Durall

In both inoculated and spontaneous fermentations, recent evidence supports the idea that the yeast community fermenting wine can be highly influenced by the yeast residents of the winery. The objective of this study was to compare yeast dynamics during inoculated and spontaneous fermentations produced at a Canadian winery. In addition, a comparison of the yeast assemblage in fermentation tanks with yeast inoculants used by the winery was made to determine the influence of resident yeasts on the yeasts fermenting the wine. During the 2012 vintage, 3 inoculated and 3 spontaneous Vitis vinifera L. var. Pinot noir fermentations from Quails' Gate Estate Winery were sampled from four stages (cold soak, early, mid and end). Saccharomyces cerevisiae isolates were

discriminated at the strain level by microsatellite analysis and identified by comparing DNA fingerprints to microsatellite databases. Non-Saccharomyces species were identified by sequencing the D1/D2 domain regions of rDNA. In the inoculated tanks, implantation of the inoculant ranged from 75 to 100 percent at the end of fermentation. In the early, mid and end stages of both inoculated and spontaneous fermentations, the predominant yeasts were either inoculated or non-inoculated commercial ADY strains previously used at the winery. For all fermentations, a typical succession from non-Saccharomyces to Saccharomyces cerevisiae strains was observed. On the whole, the composition and diversity of yeast assemblages were similar between the 2011 and 2012 vintages. Yeast assemblages developing after cold soak were similar to the strains used at the winery. Data, such as these presented in this study, is useful for winemakers when it comes to making yeast selections for their fermentations.

The occurrence of yeasts in air and on surfaces of a British Columbia winery before and after grape arrival and commercial yeast handling

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Student: Laura Feeny

Supervisor: Dr. Dan Durall

Yeasts present on surfaces and in the air of wineries can influence the diversity and composition of the yeast community found in inoculated and spontaneous fermentations. Recent research has shown that during the month of vinification, the yeasts found in the winery environment are directly determined by activities occurring in the winery. Currently, research identifying the yeasts present on the surfaces and in the air of wineries is limited. The objectives of this study were to identify yeast in the air and on winery surfaces before and after grape arrival and before and after inoculant use. We were also interested in comparing the yeasts found in spontaneous fermentations with those isolated from the surfaces and air of the winery. During the 2012 vintage, air and surfaces were sampled from Quails' Gate Estate Winery (QGEW) before and after the arrival of grapes and before and after the opening of commercial yeasts. Isolates were identified at the species level by sequencing the D1/D2 domain or ITS regions of rDNA. *Saccharomyces cereviseae* was further distinguished by strain using microsatellite analysis. Following the handling of commercial yeasts in the winery, both air and surface samples contained high amounts of the commercial yeast used for the current vintage. Air and surface yeasts were not affected by the presence of harvested grapes in the winery. Commercial yeasts identified in the air and surface samples matched those present in the spontaneous fermentations. This research demonstrated that the manipulation of commercial yeast products can greatly impact the yeasts present in the winery environment and, consequently, can affect the populations of yeasts fermenting wine must. Greater understanding of the sources of the yeasts that populate fermenting wine can be of use in educating the actions of winemakers who seek to control the quality of their wines through microbiological means.

IKBSAS Undergraduate Research Conference

Oral Presentation Schedule – Session 4 - Room FIP 249

Thursday, April 4, 2013

Session	First Name	Last Name	Presentation Title	Time
4	Gurleen	Gill	Construction of a pET28/GFP fusion vector to allow for better visualization and predict solubility of expressed foreign protein products.	1:00 - 1:20
4	Robert	Granberg	Upregulating the Delta 6 Fatty Acid Desaturase Gene in Mouse Embryonic Fibroblasts in Order to Study Omega Fatty Acid Metabolism	1:20 - 1:40
4	Matt	Glover	Determination of copper accumulation in the tissues of larval *Aedes aegypti* following 24-hour exposure to water borne copper	1:40 - 2:00
4	Sierra	Padmoroff	Analysis of Linalool Synthases of *Lavandula*: Cloning of linalool synthase from *L. x intermedia.*	2:00 - 2:20
4	Rochelle	Tonkin	Differential Control of Electron Flow in Human and *Artemisia annua* NADPH-Cytochrome P450 Reductase	2:20 - 2:40
4	Thomas	Cameron	Identification of omega-6 induced mechanisms of hepatic insulin resistance in mice	2:40 - 3:00
4	Douglas	Whitelaw	The role of Tyrosine 187 in vitamin B12 and B6 dependent ornithine 4,5-aminomutase: Controlling radical chemistry in an enzyme.	3:00 - 3:20
4	Jenelle	Lamothe	Mitochondrial transcription factor A: Role in microglial neurotoxicity and potential molecular target.	3:20 - 3:40
4	Kaida	Penney	The introduction of an alien fungus into a natural ecosystem to determine its persistence, invasiveness and detection limits	3:40 - 4:00

Construction of a pET28/GFP fusion vector to allow for better visualization and predict solubility of expressed foreign protein products.

Student: Gurleen Gill

Supervisor: Dr. Mary Forrest

Many members of the manumycin family of antibiotics are used in antitumor treatments due to their ability to inhibit farnesyltransferase. A weaker member of their family, asukamycin, is currently being studied for its antitumor abilities, and efforts are being made to alter its structure in attempts to improve this function. The main structural difference between asukamycin and more powerful manumycins is the presence of a cyclohexane carboxylic acid (CHCA) moiety at the end of its upper polyketide chain. A key bifunctional enzyme, EPSP synthase/CHC-CoA ligase is believed to be responsible for covalently bonding this structure to the polyketide chain. The gene responsible has been designated ORF 23/24. Cloning and expressing the product from this gene would be a good first step in studying whether the CHCA moiety can be modified to increase the antitumor effects of asukamycin. ORF 23/24 and ORFmid1a (the first half of the bifunctional gene) were both previously cloned into the expression vector pET28a. However only insoluble inclusion body pellets were obtained, despite multiple attempts at increasing solubility. The expression, extraction, and gel electrophoresis of proteins can be a time-consuming process. The focus of this project was to construct a pET28a/GFP fusion vector to allow better visualization of the protein product and thus predict success or failure of solubility more quickly. GFP was first amplified through PCR and then cloned into pUC19, a maintenance vector. It is now being introduced into pET28a as a control, and into pET28::mid1a to test its ability to predict expressed protein solubility. Further modifications of the pET28a/GFP vector will allow a variety of genes to be inserted, using the easily detected GFP to determine the success and solubility of these expressed foreign protein products.

Upregulating the Delta 6 Fatty Acid Desaturase Gene in Mouse Embryonic Fibroblasts in Order to Study Omega Fatty Acid Metabolism

Student: Robert Granberg

Supervisor: Dr. Mary Forrest

The Western diet contains an unfavorable dietary ratio of the essential fatty acids (EFAs) linoleic acid (LA) and alpha linolenic acid (ALA) due to the cultivation of choice crops. This has resulted in the average Westerner consuming 10-30 times more LA than ALA. These EFAs are metabolized by parallel catabolic pathways in which the substrates compete for key enzymatic sites. This may be an issue within the Western diet because research indicates that the LA catabolic pathway is associated with pro-inflammatory mediators, and thus the imbalance could be promoting the unfavorable inflammatory reactions that are prevalent in the Western world. The first enzyme that the EFAs compete for is delta 6 fatty acid desaturase (FADS2). Both EFA substrates utilize the same enzymatic binding pocket to progress through their respective pathways, and thus the binding of one substrate (LA or ALA) inhibits the catabolism of the other. Upregulating the expression of FADS2 within a mouse cell line

(NIH/3T3) will allow tests to determine the importance and effect of the EFA bottleneck at this step, and provide a means to test the comprehensive effect of the competitive interaction between LA and ALA. FADS2 has been cloned and is commercially available in the expression vector pCMV::SPORT6. However, this vector cannot be selected for in eukaryotic cells, which constrains study to only transient expression in the NIH/3T3 mouse cell line. This project involves the subcloning of the FADS2 gene into the eukaryotic expression vector pTARGET. The pTARGET vector can be selected for in eukaryotic cells using neomycin, thus ensuring longer-term expression for study. Future work will involve the transfection of the pTARGET::FADS2 construct into the NIH/3T3 cell line for analysis of the upregulation of FADS2.

Determination of copper accumulation in the tissues of larval Aedes aegypti following 24-hour exposure to water borne copper

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Student: Matt Glover

Supervisor: Dr. Mark Rheault

The transition metal copper is an essential trace element that is critical to the metabolic function of all eukaryotic organisms. Copper is utilized as a cofactor for a number of metabolic enzymes, such as cytochrome C oxidase, which is essential for ATP synthesis. It is therefore critical that all organisms be able to efficiently regulate levels of copper in various tissues. Previous studies have demonstrated the high resistance of *A. aegypti* to water borne copper. 4th instar larva of *A. aegypti* were exposed to 0.5 and 2.0 mmol l^{-1} Cu^{2+} for 24 hours and ^{63}Cu was measured using inductively coupled plasma mass spectrometry (ICP-MS). Whole body, midgut, Malpighian tubules, hindgut, anal papillae tissues and haemolymph were tested. These tissues represent structures previously demonstrated to be responsible for ion regulation in insects. We found that copper levels increased significantly from the control exposure in both the 0.5 and 2.0 mmol l^{-1} Cu^{2+} treatments. However, copper levels remained constant or decreased in all tissues between 0.5 and 2.0 $mmol^{-1}$ Cu^{2+} treatments. Along with previous work in the expression of copper transporters in *A. aegypti*, these results indicate a mechanism to combat the buildup of lethal levels of toxic copper. The results of this research expand current knowledge on how transition metals such as copper are regulated in insects.

Analysis of Linalool Synthases of Lavandula: Cloning of linalool synthase from L. x intermedia.

Student: Sierra Padmoroff

Supervisor: Dr. Soheil Mahmoud

The genus *Lavandula* (lavenders) is composed of several species, including *L. angustifolia* and *L. latifolia*, and their natural hybrid *L. x intermedia*. These plants are widely grown for their valuable essential oils which are extensively used in cosmetics, hygiene products, and alternative medicine (e.g. aromatherapy). The primary constituent of the essential oil of these species is the highly aromatic, 10 carbon biochemical compound linalool. In plants, linalool is derived from the precursor molecule geranyl diphosphate (GPP) through the catalytic action of the enzyme linalool synthase (LINS). The main objective of this study was to clone and functionally characterize the *L. x intermedia* linalool synthase enzyme (LiLINS) from a cDNA library previously developed in Dr. Mahmoud's laboratory at UBC, Okanagan campus. The gene encoding LiLINS was successfully cloned into the bacterial expression vector pET41b (+), and expressed in Rosetta (DE3) pLysS *E.coli* cells. Following induction of the bacterial cells by IPTG, the recombinant LiLINS protein was visualized by gel electrophoresis. Crude bacterial extracts containing the recombinant protein were able to produce linalool from GPP *in vitro*, confirming the identity of the cloned gene. An NCBI blast analysis showed that linalool synthase of *L. x intermedia* shares the most sequence similarity with that of its *L. latifolia* parent.

Differential Control of Electron Flow in Human and Artemisia annua NADPH-Cytochrome P450 Reductase.

Student: Rochelle Tonkin

Supervisor: Dr. Kirsten Wolthers

Artemisinin is a highly effective drug for the treatment of malaria, a global disease that affects 350-500 million people and results in approximately 1 million deaths annually. Cytochrome P450 monooxygenase, CYP71AV1, functions in the biosynthesis of artemisinin. The catalytic activity of CYP71AV1, as for many members of the cytochrome P450 superfamily, is dependent on electron transfer from a single enzyme, cytochrome P450 reductase (CPR). CPR transfers reducing equivalents from NADPH via an FAD and FMN cofactors to the cytochrome P450 monooxygenases, in the direction of NADPH to FAD to FMN to P450. Preliminary experiments demonstrated that CPR from *Artemisia annua* (aaCPR) is faster at extracting a hydride ion from NADPH, compared to the human equivalent (hCPR). Sequence alignment of aaCPR with hCPR revealed that hCPR contains an extra C-terminal S678 residue that may be involved in modulating hydride transfer by hindering the catalytic placement of the NADPH cofactor. To investigate this, site directed mutagenesis was performed to add S678 to aaCPR and delete S678 from hCPR. The purified mutants were analyzed by stopped-flow spectroscopy. For aaCPR mutant, flavin reduction by the first and second equivalents of NADPH resulted in a 1.4-fold decrease in both rate constants, compared to the native enzyme. In contrast, the rate constants for hCPR mutant decreased by 1.2-fold, compared to native hCPR.

Substitution of NADPD for NADPH cofactor in aaCPR, resulted in an isotope effect, ^{D}k, of 1.6 on flavin reduction. From these findings, it was concluded that the S678 residue does not significantly modulate the catalytic rate, and some other factor must be involved in catalysis that will require further exploration.

Identification of omega-6 induced mechanisms of hepatic insulin resistance in mice

Student: Thomas Cameron

Supervisor: Dr. Sanjoy Ghosh

By 2030, 438 million people are expected to have diabetes. This rise in disease is predicted to be an effect of changing environmental factors like diet. Among recent dietary changes, the current North American diet contains high amounts of omega-6 polyunsaturated fatty acids (PUFA). However, the effects of omega-6 PUFA on insulin signaling have not been fully established. In this study, mice were fed a diet rich in PUFA (from corn oil), monounsaturated fatty acids (MUFA), or a balance of PUFA and MUFA (from canola oil). A low fat control diet was utilized to evaluate the effect of all high fat diets per se. Liver protein was then isolated and the effect of fatty acids on the insulin signaling pathways composed of insulin receptor substrates like IRS1, various PI3-Kinase subunits, and protein kinase B was investigated. In a dose dependent manner, omega-6 PUFA increased p85, an inhibitory subunit of PI3 kinase in the insulin signaling cascade. MUFA reversed this trend. Omega-6 PUFA also increased other inhibitory phosphorylation sites while MUFA increased insulin sensitizing phosphorylation. The results show a strong correlation between omega-6 PUFA and decreased insulin signaling, whereas MUFA was associated with increased insulin sensitivity. These results could provide important clues to elucidate the molecular basis for the rise in insulin resistance in North American, including Canada.

The role of Tyrosine 187 in vitamin B12 and B6 dependent ornithine 4,5-aminomutase: Controlling radical chemistry in an enzyme.

Student: Douglas Whitelaw

Supervisor: Dr. Kirsten Wolthers

Controlling radical species is a difficult task in chemical reactions, so investigating enzymes capable of this feat may prove significant in the field of drug synthesis. Ornithine 4,5-aminomutase (OAM) of *Clostridia Sticklandii* is an adenosylcobalamin (AdoCbl) and pyridoxal-5'-phosphate (PLP) dependant enzyme that catalyzes a 1,2-amino shift on D-ornithine to form 2,4-diaminopentanoic acid. Catalysis initiates with radical propagation from AdoCbl to ornithine, which is covalently linked to the PLP cofactor. The substrate-derived radical then undergoes isomerization to form the product. PLP is thought to lower the activation energy barrier through electron delocalization through the cofactor's pyridine ring. The crystal structure of OAM reveals several residues that can participate in tuning the action of the PLP cofactor. Tyr187 forms hydrogen bonds with the phosphate group of

PLP, locking it in a position that favors π stacking with the pyridine moiety. To investigate the role of Tyr187 in catalysis, this residue was mutated to a phenylalanine. Steady state analysis showed a 20-fold decrease in catalytic rate and a 7-fold decrease in catalytic efficiency. Spectroscopic analysis shows that the Y187F mutant still exhibits transaldimation and Co-C homolysis in the presence of D-ornithine. In the presence of 2,4-diaminobutyric acid (DABA), a substrate analog that forms a persistent radical intermediate, both transaldmination and Co-C homolysis occurred akin to wild type OAM. Aerobic studies with DABA showed that the rate of O_2-mediated hydroxycobalamin formation was slower than wild type OAM, suggesting that the mutant is less oxygen sensitive, or that the DABA radical is less stable, and thus less cob(II)alamin accumulates in the active site. The combined data suggest that Tyr187 plays an important role in catalysis, but surprisingly it differs from that of an analogous residue in a related enzyme.

Mitochondrial transcription factor A: Role in microglial neurotoxicity and potential molecular target.

Student: Jenelle Lamothe

Supervisor: Dr. Andis Klegeris

Neurodegenerative disorders, such as Alzheimer's disease and Parkinson's disease, are associated with a chronic state of neuroinflammation. Under the conditions of chronic inflammation, the glial cells of the brain can release inflammatory mediators and neurotoxic compounds that result in neuronal cell death. My research has been focused on possible triggers of this inflammatory response. The damage associated molecular pattern (DAMP) hypothesis of inflammation states that endogenous factors released after host cell damage or death triggers activation of the inflammatory response in neighbouring cells. Therefore, my project explores the role of one of the DAMP molecules, mitochondrial transcription factor A (TFAM), in triggering microglial cell toxicity toward neurons. To study TFAM's ability to activate microglial cells, mitochondrial fractions were isolated from human cells. TFAM was removed from mitochondrial samples by way of immunoprecipitation. Microglia-like THP-1 cells were then treated with these samples, and their toxicity toward the SH-SY5Y neuroblastoma cell line was compared with untreated samples that contained TFAM. TFAM is closely related in structure to the high mobility group box 1 (HMGB1), a well-known DAMP. HMGB1 initiates its pro-inflammatory activities by binding the receptor for advanced glycation end-products (RAGE) on microglia-like cells. To examine whether TFAM might also act through a RAGE-dependent mechanism, THP-1 cells were treated with heparin sodium salt, a glycosaminoglycan known to inhibit RAGE-mediated events, prior to treatment with TFAM. Pre-treatment with heparin decreased TFAM-induced toxicity of THP-1 cells towards SH-SY5Y neuronal cells. This indicates that TFAM may carry out its pro-inflammatory functions in microglial cells through binding of RAGE. Research relating to the function and molecular targets of endogenous pro-inflammatory mediators, such as TFAM, will allow for a better understanding of neuroimmune reactions and can be used to design new therapeutic agents.

The introduction of an alien fungus into a natural ecosystem to determine its persistence, invasiveness and detection limits

Student: Kaida Penney

Supervisor: Dr. Miranda Hart

Arbuscular mycorrhizal (AM) fungi have been used as biofertilizer for agriculture, horticulture and land reclamation industries for many years. The purpose of this study was to investigate whether or not the AM fungi actually establishes and persists when introduced into these new environments. *Rhyzophagus irregularis*, a commercial AM fungal inoculant, was introduced into both a natural environment and an artificial greenhouse experiment by pre or post inoculation of two host plants. I used molecular approaches to quantify the abundance of this isolate over space and time during the first growing season in order to measure the success of the AM fungi by monitoring its establishment after inoculation. In this talk, I will discuss results from our molecular analysis, as well as results from the greenhouse experiment on fungal abundance using visual detection methods, and host response to inoculation. These data will be used to investigate the possibility of invasiveness beyond the intended point of inoculation, and to determine if our known detection limits are sensitive enough to pick up trace amounts of the fungi in the environment.