

2012

Irving K. Barber School of Arts and Sciences
7th Annual Undergraduate Research Conference
Wednesday, April 4, 2012

ORAL PRESENTATION SCHEDULE & ABSTRACTS

IKBSAS Undergraduate Research Conference
Oral Presentation Schedule – Session 1 - Room FIPKE 247
Wednesday, April 4, 2012

Session	First Name	Last Name	Presentation Title	Time
1	Ruby	Bahniwal	Omega-6 PUFA induces inflammation in the skeletal muscle in a MCP-1 dependent manner	1:20 - 1:40
1	Colby	Renschler	Priming of the phagocyte respiratory burst: mechanisms, disease-specific involvement, and potential therapeutic targets.	1:40 - 2:00
1	Daniella	DeCoffe	The Effects of Polyunsaturated Fatty Acid Diets on Intestinal Immunity in Mice	2:00 - 2:20
1	Erin	Molcan	Bacterial composition, inflammation and enzymatic regulation in the gut of aged mice fed high-fat diets.	2:20 - 2:40
1	Alex	Pickering	Extending Life by Eating Less: The Hormonal Signal Hypothesis	2:50 - 3:10
1	Rebekah	Barendregt	The Effects of Common Dietary Fats on Macrophage Function in Hyperglycemia	3:10 - 3:30
1	Stephanie	Ruscheinsky	Gastrointestinal Microbiota accelerate type 1 diabetes in the non-obese diabetes mouse model	3:30 - 3:50
1	Ashley	Yip	The components of medicinal lavender have different antimicrobial activity in protecting against <i>Citrobacter rodentium</i> -induced colitis	3:50 - 4:10

Omega-6 PUFA induces inflammation in the skeletal muscle in a MCP-1 dependent manner

Student: Ruby Bahniwal

Supervisor: Sanjoy Ghosh

Type-2 diabetes is caused by progressive insulin resistance and inflammation in the skeletal muscle. We believe that overabundance of omega-6 polyunsaturated fatty acids (PUFA) in cooking oils like corn oil may lead to insulin resistance via development of endoplasmic reticulum (ER) stress. My project was to identify skeletal muscle responses that could lead to insulin resistance under various dietary conditions in mice. Two strains of mice, C57/Bl6 and monocyte chemoattractant protein-1 (MCP-1) null mice, were fed two fatty acid-containing diets (omega-6 PUFA and monounsaturated fatty acids or MUFA) for 5 weeks, following which their gastrocnemius muscle samples were collected. Western blotting was used to assess protein expression followed by quantification of band intensity using the Image J software. Monocyte chemotactic protein-1 (MCP-1) is a factor that induces inflammation by recruiting monocytes to sites of injury. Based on previous data, we speculated that if any dietary condition induces inflammation in muscle, MCP-1 null mice should be protected from such effects. Omega-6 PUFA increased expression of almost all ER stress markers (IRE-1 α , Perk, and BiP) in the C57/Bl6 muscle whereas mice fed MUFA or MCP-1 null mice fed omega-6 PUFA did not. Both ER protein chaperones involved in the folding of proteins (PDI and ERO-1 α) or pro-apoptotic chaperones (CHOP-1) did show a significant difference between diet groups in the presence of MCP-1; however, this effect was not observed for MCP-1 null mice. In conclusion, the results from this study suggest that overabundance of omega-6 polyunsaturated fatty acids in the diet may induce ER stress in the skeletal muscle, at least partially by an MCP-1 dependent manner, which may promote insulin resistance over time.

Priming of the phagocyte respiratory burst: mechanisms, disease-specific involvement, and potential therapeutic targets

Student: Colby Renschler

Supervisor: Andis Klegeris

Oxidative stress is a hallmark characteristic of many diseases, especially those involving inflammatory processes. A major contributor to inflammation in the human body is the respiratory burst of reactive oxygen species (ROS) produced by immune cells. This response is essential for clearing invading pathogens, but is relatively non-specific and can harm host tissue as well. ROS production can be activated in diseases characterized by chronic neuroinflammation, such as Alzheimer's and Parkinson's diseases. The release of ROS in the respiratory burst can be increased, or primed, by prior exposure to certain macromolecules. This project attempted to characterize this phenomenon utilizing priming agents associated with specific inflammatory diseases. Differentiating these responses could help understand complex inflammatory disorders and may help identify targets for drug therapy that inhibit the disease-specific priming processes while maintaining the essential respiratory burst immune function. The respiratory burst is mediated by the enzyme nicotinamide adenine dinucleotide phosphate (NADPH) oxidase and can be measured by a chemiluminescence assay. Immune cells are stimulated to release ROS, which react with luminol in the assay to release light. Lipopolysaccharide, an endotoxin derived from gram-negative bacteria, mitochondrial transcription factor A, and the Alzheimer's and Parkinson's disease-related proteins

amyloid-beta and alpha-synuclein, respectively, were tested for their respiratory burst priming responses. Several drugs were used to inhibit this process and identify cellular pathways involved in priming, including the rheumatoid arthritis gold drug, auranofin. The in vivo distribution of auranofin is poorly understood. Therefore, mice were treated with auranofin and gold was measured in several tissues post-mortem by laser-ablation inductively-coupled plasma mass spectrometry. This project has the potential to further the understanding of respiratory burst priming and may identify drugs that can alleviate this response in various diseases.

The Effects of Polyunsaturated Fatty Acid Diets on Intestinal Immunity in Mice

Student: Daniella DeCoffe

Supervisor: Dr. Deanna Gibson

Inflammatory Bowel Diseases (IBD) are a major concern in the Western Hemisphere. The excessive consumption of n-6 PUFA diets increases the risk of ulcerative colitis by 30%, whereas consumption of DHA (n-3 PUFA) reduces the risk of disease by 77%. Therefore, diets rich in n-6 PUFA may contribute to inflammatory disease, while n-3 PUFA may protect against them. However, some studies have shown n-3 PUFA to be beneficial while others have shown it to exacerbate colitis. In order to determine the effects of PUFAs on intestinal inflammation we fed post-weaned mice corn oil (high in n-6 PUFA), corn oil and fish oil (high in n-3 PUFA) and high and low fat controls. We then inspected their intestinal tissues for inflammation both before and during colitis induced by *Citrobacter rodentium*. We used quantitative PCR and immunofluorescence to identify different inflammatory markers. Adiponectin, an anti-inflammatory protein hormone, was significantly decreased in the n-6 PUFA diets. Prostaglandin E2 (PGE2), a marker for inflammation was highly expressed in the n-6 PUFA diet during colitis but was not in the n-3 PUFA diet fed colitic mice. Lastly, Intestinal Alkaline Phosphatase (IAP), an intestinal brush border enzyme was decreased in the n-6 PUFA fed colitic mice compared to the n-3 PUFA fed colitic mice. Overall, our results suggest that diets rich in n-6 PUFA increase intestinal inflammation while n-3 PUFA diets are anti-inflammatory. This research could provide an adaptive approach to altering immune response through dietary lipid intake.

Bacterial composition, inflammation and enzymatic regulation in the gut of aged mice fed high-fat diets.

Student: Erin Molcan

Supervisor: Dr. Deanna Gibson

There are over 1000 different species of bacteria that inhabit our intestinal tract. They play an important role in absorption of nutrients and defence against infection through their involvement in the development of our immune system. These species live in a state of homeostatic symbiosis with us. However, some of these microbes can become aggressive and disrupt the natural homeostasis, known as dysbiosis, which may be caused by environmental factors such as diet and aging. Specific dietary elements involved in impaired intestinal immunity, dysbiosis, and potential enzymatic regulation have not yet been identified. We hypothesize that aged mice fed diets high in n-6 polyunsaturated fatty acid (PUFA)(omega-6) will show decreased levels of beneficial bacteria with a subsequent increase in more harmful bacteria, causing altered immune responses, oxidant status, and host

enzyme activation; these effects will be reversed upon supplementation with n-3 PUFA (omega-3). Using fluorescence *in situ* hybridization and immunofluorescence, the effect that various high-fat diets have on microbial ecology, inflammatory status and enzymatic activation in the gut of aged mice has been elucidated. Aged mice fed a diet high in n-6 PUFA were found to have higher levels of pathogenic bacteria, along with a low oxidative status and increased expression of regulatory T-cells. In contrast, aged mice fed a high-fat diet supplemented with n-3 PUFA (omega 3 fish oil) show increased levels of beneficial bacteria with decreased harmful bacteria, altered oxidative status and increased expression of regulatory T-cells compared to low-fat controls. The group fed n-3 PUFA also have increased expression of enzymes involved in adipogenesis, which is the development of fat cells. From this, we can conclude that although n-3 PUFA restores microbial balance in our intestines, higher levels of fat production and inflammatory reactions are occurring compared to the n-6 PUFA group. With an aging population and inflammatory conditions on the rise, it is important to understand the effects that high-fat intake has on our intestinal health during aging.

Extending Life by Eating Less: The Hormonal Signal Hypothesis

Student: Alex Pickering

Supervisor: Dr. Joyce Boon

In the past 77 years, gerontologists have established that rodents fed substantially less food live longer and healthier lives. The instinctual idea that life is extended by preventing obesity is likely wrong. In addition, calorie reduction does not seem to slow metabolism. Although caloric restriction does reduce oxidative damage, there is strong evidence against the oxidative stress theory of aging. The mechanisms by which reduced caloric intake extends lifespan are unclear. Adaptation to food shortage does seem to require hormonal communication between organs and tissues. Enhancement or imitation of these signals could extend life and preserve youthfulness. Knowledge of their effects may explain aging.

The Effects of Common Dietary Fats on Macrophage Function in Hyperglycemia

Student: Rebekah Barendregt

Supervisor: Sanjoy Ghosh

Diabetes is characterized by high blood glucose (hyperglycemia) and an increased risk of infection. Immune cells like macrophages play a major role in immunity but are impaired in diabetic subjects. Macrophages generate free radicals (called oxidative burst) to kill invading pathogens during an infection. While circulating fatty acids can affect immunity, how common dietary fatty acids (FA) regulate oxidative burst and macrophage function remains unclear. In this study, I aimed to determine how various FA influence the function of RAW 264.7 cells (a mouse macrophage cell line) during hyperglycemia. Bacterial lipopolysaccharide (LPS) was used to simulate infection and an inflammatory response in the macrophages. Palmitate (PA), oleate (OA), and linoleate (LA) were chosen to represent three classes of dietary FA: saturated, monounsaturated, and omega-6 polyunsaturated FA, respectively. I then determined the effects of these conditions on cell viability, redox capacity, and generation of free radicals in RAW 264.7 cells. Chronic exposure to high glucose (25mM) without LPS stimulation or FA (baseline conditions) reduces mitochondrial redox capacity and increases free radical generation in macrophages. To study the effects of FA, we incubated RAW 264.7 with various FA with high glucose and stimulated with LPS. 1mM PA or LA under such conditions significantly reduced cell viability in RAW 264.7 macrophages, whereas OA was non-toxic. This data points towards the cytoprotective effect of oleate even under hyperglycaemic conditions. With a lower dose of 0.25mM FA, cell viability was not affected with any FA. Interestingly, only LA significantly decreased ROS generation in response to LPS compared to all other FA. This data suggests that chronic overexposure of LA, as seen in our current Canadian diet could reduce oxidative burst capacity of macrophages during hyperglycemia and inflammation/infection. This mechanism could contribute to augmented infection rates among diabetic patients in Canada.

Gastrointestinal Microbiota accelerate type 1 diabetes in the non-obese diabetes mouse model

Student: Stephanie Ruscheinsky

Supervisor: Dr. Deanna Gibson

An estimated 285 million people worldwide are affected by diabetes. Type 1 Diabetes (TD1) is an autoimmune disease that involves T-lymphocytes attacking insulin producing β -cells that results in pancreatic inflammation known as insulinitis and eventually leads to diabetes. Recent research has found that intestinal microbes, which normally live symbiotically within the host, may play a role in the development of diabetes. Clinically, prior to diabetes onset, patients have displayed microbiota dysbiosis, or deviation from the normal microbial composition. Since the intestine and pancreas are connected through the mesenteric and pancreatic lymph nodes, microbial antigens serve as a potential source of activated self-reactive circulating T-lymphocytes. Dr. Gibson's lab had previously found that the intestinal microbiota alters intestinal inflammation and barrier function which triggers the onset of T1D in mice. In this study, we investigated the role of the intestinal microbes on T1D in the NOD mouse model and characterized the microbial ecology in mice resistant and susceptible to T1D using quantitative PCR. We found that antibiotic treatment accelerates T1D in NOD mice compared to the NOD mice without treatment supporting an important role for the microbes in T1D onset. Using qPCR to type enteric organisms in

these mouse strains, we found that the colonic microbiota differ by a number of important bacterial species in the NOD female mice compared to those that are resistant to diabetes. Female NOD mice are enriched with *Enterobacteriaceae*, a microbe often associated with intestinal inflammation. As well, NOD mice are specifically depleted in *Lactobacillus sp.* and *Bifidobacterium sp.*, both of which have been found to be anti-inflammatory in the colon. We also found Segmented Filamentous Bacteria (SFB) was reduced in NOD mice, a microbe shown to induce intestinal Th17 immunity. This research provides insights into what microbes are involved in accelerating T1D onset.

The components of medicinal lavender have different antimicrobial activity in protecting against *Citrobacter rodentium*-induced colitis

Student: Ashley Yip

Supervisor: Deanna Gibson

Inflammatory bowel diseases are chronic, immunologically mediated disorders in the gastrointestinal tract. They are a major health burden in Western society, with recent estimates revealing 1 in 200 individuals in North America suffer from these diseases. Since current therapeutic approaches are risky or ineffective for long-term use, developing new therapies or methods for prevention remains a priority. Lavender oil is a traditional medicine used to relieve many gastrointestinal disorders. It has been previously demonstrated to protect colitic mice from morbidity and mortality, reduce intestinal tissue damage and decrease inflammatory responses. The therapeutic strength of lavender oils is determined by the properties of their constituents, primarily camphor, 1,8-cineole and borneol. While the components' synergistic effects have been demonstrated to be protective, their properties in isolation were previously undetermined. Using a novel lavender cultivar that produces a unique blend of essential oil, Okanagan Lavender Essential Oil (OLEO), high in antimicrobial and anti-inflammatory activity, we examined the antimicrobial activity of the components of OLEO against a bacteria that models colitis, *Citrobacter rodentium*, and in colonic epithelial cells infected with *C. rodentium*. We found that 1,8-cineol in isolation possessed antimicrobial activity, while the other components did not; however, its potency was not as strong as the synergistic effects of OLEO. Our results demonstrate that OLEO has direct cytotoxicity to *C. rodentium*, and suggest that genetically modifying the cultivar to contain a higher percentage of 1,8-cineol would create an oil with greater therapeutic effects against colitis.

IKBSAS Undergraduate Research Conference
 Oral Presentation Schedule - Session 2 – FIPKE 249
 Wednesday, April 4, 2012

Session	First Name	Last Name	Presentation Title	Time
2	David	Donnelly	Harnessing next-generation DNA sequencing and genotyping technologies for adaptive marker development in natural populations	1:20 - 1:40
2	Lauren	Erland	Regeneration of <i>Lavandula pinnata</i> (fernleaf lavender) & <i>Coriandrum sativum</i> (coriander), and cloning of an essential oil-related gene.	1:40 - 2:00
2	Jeanette	Madsen	Extirpation by Introgression?: Investigating the genetic consequences of released painted turtles on endangered <i>Chrysemys picta bellii</i> in British Columbia.	2:00 - 2:20
2	Matthew	Meehan	Search for the Younger-Dryas in British Columbia: a paleoenvironmental temperature inference from Chironomidae	2:20 - 2:40
2	Chris	Milner	Evaluation of cell free extracts from <i>Pseudomonas fluorescens</i> 4-6 against three common pome fruit infectious diseases	2:50 - 3:10
2	Jillian	Rutherford	Using Operant Conditioning to Facilitate Physiological Sampling from Captive Ungulates.	3:10 - 3:30
2	Mansak	Tantikachornkiat	Population Dynamics of <i>Saccharomyces cerevisiae</i> strains during Inoculated and Spontaneous Fermentations in Quail Gate Estate Winery	3:30 - 3:50

Harnessing next-generation DNA sequencing and genotyping technologies for adaptive marker development in natural populations

Student: Dave Donnelly

Supervisor: Michael Russello

Is there a genetic basis underlying behavioural adaptations, and can this information help to inform management strategies for species at risk? As the analytical power of population genomics increases, we may be closer to resolving these questions among natural populations of non-model organisms. The species pair studied here are distinct ecotypes of kokanee salmon that show divergent reproductive behaviours. Individuals exhibiting the classic stream-spawning behaviour coexist with the divergent shore-spawning ecotype in post-glacial freshwater lakes. Within the broader context of genes and adaptation, my research focused specifically on identifying potentially adaptive markers from kokanee whole-transcriptome sequences, and tested the application of high resolution melt analysis (HRMA) as a high-throughput genotyping tool. With the aid of published reference genes of known function, 43 novel single nucleotide polymorphism (SNP) markers were identified that exhibit ecotype-specific allele frequencies. To further characterize these potentially adaptive markers, a large sample of Lake Okanagan kokanee and Okanagan River anadromous sockeye (n=93) was genotyped using HRMA. Of the 43 markers, 19 were successfully genotyped, providing data that is currently being used to resolve fine-scale population genetic structure within this system. This work is a contribution towards the ultimate goal of elucidating the genetic basis of adaptation within natural populations and applying this information to biodiversity conservation and fisheries management.

Regeneration of *Lavandula pinnata* (fernleaf lavender) & *Coriandrum sativum* (coriander), and cloning of an essential oil-related gene.

Student: Lauren Erland

Supervisor: Dr. Soheil Mahmoud

Plant regeneration involves induction of callus (undifferentiated cells) from somatic tissue (for example, leaves), and subsequent production of new plants from callus cells. Applications of this technology include the mass production of genetically identical plants for the ornamental industry, production of disease-free plants, and development of improved plants through somoclonal variation. This non-GMO technology has been used to improve numerous agriculturally important plants (e.g. apples, grapes, cherries) and even to produce new varieties. Both coriander and lavender produce industrially valuable essential oils, and so there is interest in improving these plants. In this study protocols were developed for the regeneration of *C. sativum* and *L. pinnata*. *C. sativum* readily developed callus (80-81% of all explants) on MS media supplemented with 2,4-D, at 20-25°C, and callus cells produced embryos when treated with 4.52 μ M 2,4D. These embryos developed into shoots in the presence of 2.25 μ M BA and 2,4-D. Though *L. pinnata* produced large amounts of callus (88-97% of all explants produced callus) on MS media with equal concentrations (in the range of 0.5 – 1.5 μ M) 2,4D and kinetin, shoot production could not be induced.

In a separate study, the gene encoding the small subunit of the heterodimeric enzyme geranyl diphosphate synthase (ssGPPS), an important regulatory enzyme in the synthesis of essential oil constituents in plants, was

cloned from the glandular DNA of Grosso lavender. The enzyme was expressed in bacteria, purified by affinity chromatography, and assayed for activity *in vitro*. Although ssGPPS from some plants is active alone, the *L. x intermedia* ssGPPS was not active *in vitro*.

Extirpation by Introgression?: Investigating the genetic consequences of released painted turtles on endangered *Chrysemys picta bellii* in British Columbia

Student: Jeanette Madsen

Supervisor: Dr. Michael Russello

The introduction and establishment of non-native individuals can pose severe impacts to native fauna. When the introduced individuals retain the ability to interbreed with the resident form, hybridization and introgression may occur, compromising the genetic integrity of the local population. Burnaby Lake, British Columbia has been identified as a system that may be experiencing interbreeding between two subspecies of painted turtles (*Chrysemys picta*), based on the discovery of individuals displaying intermediate morphological characteristics between the endangered native western painted turtle (*C. p. bellii*) and the non-native midland painted turtle (*C. p. marginata*). The presence of non-native turtle species is likely due to the human release of pets. The main objective of this study was to investigate the presence of non-native individuals and determine whether pollution of the native population's gene pool is occurring through hybridization with putatively non-native individuals. I sequenced the mitochondrial control region and a nuclear oncogene in 12 Burnaby Lake turtles, a representative subset of *C. p. bellii* populations across BC, and nine *C. p. marginata* from Ontario. Through analysis of within and among population variation in mitochondrial haplotypes, I identified six SNPs shared between six Burnaby individuals and *C. p. marginata* that are not present in *C. p. bellii*. Furthermore, the nuclear gene revealed six Burnaby individuals as putative non-natives due to sharing private alleles with *C. p. marginata*; two of these individuals had native mitochondrial haplotypes. These results suggest the presence of non-native turtles in Burnaby Lake. To interpret the extent to which hybridization and genetic introgression is occurring, further analyses including a more thorough sampling of the turtles present in Burnaby Lake is required.

Search for the Younger-Dryas in British Columbia: a paleoenvironmental temperature inference from Chironomidae

Student: Matt Meehan

Supervisor: Dr. Ian Walker

A paleoenvironmental reconstruction was carried out in order to ascertain evidence for, or against, existence of the late-glacial climatic fluctuation known as the Younger-Dryas (approximately 11,000 to 10,000 radiocarbon years before present) within mid-latitude West-coast British Columbia. Midge sub-families of freshwater Chironomidae were collected from a lake sediment core obtained from Mike Lake, British Columbia, Canada. The core was sub-divided into 1 cm increments spanning the time period of interest. Midges were identified to genus and the relative abundances of these midge taxa were tabulated for each 1 cm increment. The relative abundances were used to quantitatively infer July air temperatures throughout the late-glacial. Preliminary results show no evidence for a temperature fluctuation during the Younger-Dryas, contrasting with the conclusions of some earlier studies.

Evaluation of cell free extracts from *Pseudomonas fluorescens* 4-6 against three common pome fruit infectious diseases

Student: Chris Milner

Supervisor: Dr. Louise Nelson, **Co-supervisor:** Dr. Paul Shipley

Postharvest disease caused by fungal pathogens is a serious problem in the fruit industry and may account for losses of 5-20% annually. The use of synthetic fungicides is a concern due to health and environmental safety issues and alternative controls are being sought. *Pseudomonas fluorescens* 4-6 is a Gram negative bacterium isolated from Saskatchewan soil that has the potential to be used as a biological control agent against postharvest fungal pathogens that develop on pome fruit during cold storage. Antibiotic production in this isolate is being evaluated because it may be an important mechanism for suppression of opportunistic pathogens. Cell free extracts from *P. fluorescens* 4-6 grown in tryptic soy broth were extracted and tested against three postharvest apple pathogens: *Penicillium expansum*, *Botrytis cinerea*, and *Mucor piriformis* in in vitro and in vivo assays. The optimal time for production of anti-fungal metabolites by isolate 4-6 was determined by preparing cell-free extracts at five times during the bacterial growth cycle. In vitro assays were conducted in 96-well microtitre plates inoculated with each fungus and with varying concentrations of each extract. For in vivo assays extracts were applied to apples wounded and inoculated with the three fungal pathogens and disease monitored following incubation for one week at room temperature. Results of these experiments will be presented. This bacterial isolate shows promise for replacement of synthetic fungicides for control of postharvest pathogens in pome fruit during cold storage.

Using Operant Conditioning to Facilitate Physiological Sampling from Captive Ungulates

Student: Jillian Rutherford

Supervisor: Dr. John Church

Captive animals are often subjected to stressful procedures in order for physiological data to be procured. These methods can be dangerous, ineffective, and have negative impacts on the welfare of both the animals and handlers involved. Novel sampling techniques such as saliva analysis and thermographic imaging have been developed as viable alternatives to stressful forms of conventional veterinary medicine. The goal of this study was to determine if individuals from several captive ungulate species could be trained to willingly provide saliva samples and thermographic images, as alternatives to traditional sampling practices. Behavioural modification through operant conditioning was applied to members of the Elk, Camel, and Bighorn Sheep herds at the BC Wildlife Park. Both sample-providing behaviours were successfully trained in all three species, facilitating the collection of the respective data sets. This cooperative approach to veterinary action improves access to the health profiles of these individuals while minimizing stress and pain. The combination of novel sampling techniques and behavioural modification through operant conditioning can allow regular health monitoring and earlier diagnosis of illness, leading to greater overall wellbeing of captive ungulates.

Population Dynamics of *Saccharomyces cerevisiae* strains during Inoculated and Spontaneous Fermentations in Quail Gate Estate Winery

Student: Mansak (Ben) Tantikachornkiat

Supervisor: Dr. Daniel Durall

Two methods of wine fermentation include spontaneous and inoculated fermentation. Inoculated fermentation involves inoculation of a specific strain of *Saccharomyces cerevisiae* Active Dry Yeast (ADY), whereas spontaneous fermentation involves exposing the wine must to the winery environment. In this study, population dynamics of yeasts were compared between inoculated and spontaneous fermentation in Pinot Noir must. Both *S. cerevisiae* and Non-saccharomyces were sampled at four different stages of fermentation, including cold soak, early fermentation, mid fermentation and at the end of fermentation. At each stage, yeast colonies were isolated onto culture media. Discrimination between *S. cerevisiae* strains was accomplished by amplifying DNA using 5 different polymorphic microsatellite markers. Discrimination between yeast species was performed by DNA sequencing of the Inter Transcribed Spacer (ITS) and the subsequent use of the BLAST (basic local alignment search tool) through NCBI (National Center for Biotechnology Information) website. *Hanseniaspora uvarum* was the dominant yeast species in the cold soak stage. Spontaneous fermentation showed the existence of non-*S. cerevisiae* (*H. uvarum*) in the early stage and contained higher yeast diversity than the mid and end stages of fermentation. *Saccharomyces cerevisiae* strain Lalvin® ICV D254/Fermol® Premier Cru (D-254) was the dominant strain in the mid and end stages of spontaneous fermentation, whereas in inoculated fermentation the inoculant Lalvin® RC212 in early, mid, and end stages of fermentation was isolated as the dominant along with the sub-dominant D-254. We conclude, using results from 3 different years that D254 in both inoculated and spontaneous fermentation was either the dominant or sub-dominant strain during early, mid and end stages of fermentation at this one winery. These results represent one step in determining how yeasts affect the sensory attributes of wine.

IKBSAS Undergraduate Research Conference
Oral Presentation Schedule - Session 3 – ASC 271
Wednesday, April 4, 2012

Session	First Name	Last Name	Presentation Title	Time
3	Andrew	Campbell	An Energy Efficient Environmental Sensor Network for Data Collection	1:20 - 1:40
3	Riley	Day	The Dark Matter Density of Galaxies NGC 4254 and NGC 3147.	1:40 - 2:00
3	Andrea	Hyde	An Individual Based Model for Bear Movement	2:00 - 2:20
3	Braden	MacDonald	Using Dendrograms to study the hierarchical structure of molecular clouds	2:20 - 2:40
3	Stephen	Mairs	The Evolution of Giant Molecular Clouds in the Triangulum Galaxy	2:50 - 3:10
3	Stephen	Smithbower	Bulgarian Pregnancy Rates on Modern Graphics Cards: A Case Study for Implementing Monte Carlo Simulations on GPUs	3:10 - 3:30
3	Ryan	Trenholm	Saving Water: There's An App For That	3:30 - 3:50
3	Jessica	Weeres	The Use of Internet Marketing by Independent Restaurants in Kelowna	3:50 - 4:10

An Energy Efficient Environmental Sensor Network for Data Collection

Student: Andrew Campbell

Supervisor: Ramon Lawrence

Wireless sensor networks allow real-time, environmental data collection but are limited by unreliable communication links, node failures, and battery life. A robust network must handle failure of nodes and adapt its behavior to conserve energy by powering off nodes when not in use. This leads to the problem of node synchronization, as messages cannot be sent or received during power down mode. This research constructed a complete wireless sensor network that allowed data from any number of distributed sensor nodes to be collected and displayed. Challenges tackled included power management, node failures, synchronization, and adaptive routing of data messages. The system uses reference broadcasts to maintain synchronization, and layer-based routing to send data towards the sink. In neither of these protocols do nodes need to have knowledge of the network beyond the nodes they can contact directly. This allows the network to be more adaptable to changes due to nodes entering and leaving the network. The developed system will greatly reduce the cost and complexity of environmental monitoring and data collection.

The Dark Matter Density of Galaxies NGC 4254 and NGC 3147

Student: Riley Day

Supervisor: Dr. Erik Rosolowsky

When astrophysicists started to closely examine the mass and luminosity of galaxies, it was clear the results they got were inconsistent. There was matter present that was not detectable by normal means. The only evidence of its existence was from the gravitational force it exerted on its surrounding. This matter was called dark matter, but how much of a galaxy was made of dark matter? To determine the mass density of dark matter in NGC 4254 and NGC 3147, I used the carbon monoxide emission provided by the Carma Survey Toward IR-bright Nearby Galaxies. The data was refined and analyzed using a program called ROTCUR, which produced a new set of data. This new set of data was used to determine the density of different regions of each galaxy as a function of the distance of that region to the center of the galaxy. The mass of these galaxies was assumed to come from luminous matter (stars) and dark matter only. Since the mass density of the stars in these galaxies was known, I simply took the difference between my results and the known luminous matter density to determine the mass density of dark matter. The resultant density profile of both galaxies proved consistent with the commonly used Navarro-Frenk-White model.

An Individual Based Model for Bear Movement

Student: Andrea Hyde

Supervisor: Rebecca Tyson

The International Bear Association lists 6 of the 8 bear species world wide as endangered or threatened. Neither the American Black Bear or the Brown Bear are currently listed. However, with the expansion of tourism, and industry into the back country, the increased rate of human bear interactions may change that. This project aims to understand the effect that different Human-Bear Management strategies have on the movement patterns and rates of human bear interactions in Communities. I will present a novel individual-based model for bear movement in which the displacement of a bear from one habitat patch to another follows a probability function. It is not known exactly what this function should depend upon, and so our mathematical approach is helping to elucidate the motivating factors for bear movement, their relative importance, and the dispersal patterns that result.

Preliminary investigations show that including the location of food sources and of Human-Bear Interactions (HBI) is sufficient to create realistic movement patterns for an individual bear.

Using Dendrograms to study the hierarchical structure of molecular clouds

Student: Braden MacDonald

Supervisor: Erik Rosolowsky

New stars form in molecular clouds when dense parts of the cloud's molecular gas collapse due to gravity. Although we know that much, many questions remain about exactly how this process happens. There are two main ways to study this problem: by observing parts of real molecular clouds in various stages of collapse, and by using computer models to simulate the process of gas collapsing to form stars. Both observations and simulations generate huge amounts of complex data that can be difficult to analyze and compare. We have explored how graphs that we call "dendrograms" can be used to quantify the hierarchical structure of both real and simulated molecular clouds, enabling more effective analysis of data and quantifiable comparisons between simulations and observations.

The Evolution of Giant Molecular Clouds in the Triangulum Galaxy

Student: Steven Mairs

Supervisor: Dr. Erik Rosolowsky

Although much is known about the lives and evolution of stars themselves, there are many unanswered questions pertaining to the gigantic "nurseries" in which nascent suns are currently forming. These nurseries are called Giant Molecular Clouds (GMC's) and they are found in the spiral arms of galaxies such as Andromeda, Triangulum, and our own Milky Way. Using a large array of archival data in conjunction with $^{13}\text{CO}(2-1)$ observations that we

collected in September, 2011, we have sought an evolutionary sequence for the internal conditions of GMC's in the Triangulum Galaxy. By analysing the clouds for known signs of star formation, relative ages to each GMC were determined; then, the publicly-available radiative transfer code "Radex" was utilised to constrain densities and kinetic temperatures in each of six age categories. In this way, for the first time, we have determined how these properties within Giant Molecular Clouds change with age. The results of this research will potentially give insight into environmental effects on star formation and the origins of solar systems such as our own.

Bulgarian Pregnancy Rates on Modern Graphics Cards: A Case Study for Implementing Monte Carlo Simulations on GPUs

Student: Stephen Smithbower

Supervisor: Ramon Lawrence

Monte Carlo simulations are powerful tools for modeling everything from influenza outbreaks to the costs involved in treating cancer patients. As such, they serve as important aids in domains such as research, design, and policy creation. Unfortunately, these simulations also tend to be expensive in terms of both computing resources and time; some simulations can take hours or even days to complete.

Our work is an effort to take advantage of the inherent parallel processing power of cheap modern graphics cards, commonly found in both workstations and the desktops of gaming enthusiasts. Specifically, we focus on a simulation created by Statistics Canada that was designed to study Bulgarian pregnancy rates before and after the collapse of the Soviet Union. The reference simulation utilizes the ModGen statistical software, a mature package developed by Statistics Canada. In contrast, our custom implementation utilizes GPUs and is thousands of times faster, such that results can be viewed in real-time, using hardware that is a fraction of the cost of an equivalently performing computer cluster.

Saving Water: There's an App for That

Student: Ryan Trenholm

Supervisor: Ramon Lawrence

It is estimated that between 60% and 70% of municipal water usage is for residential lawn irrigation. Climate change, population growth and increased consumption require more efficient management of our water resources. The rapid development in mobile technology presents new opportunities to engage residential users about how their irrigation systems work and encourage them to use those systems more wisely. The primary focus of the project was to adapt an existing webpage-based internet interface for irrigation-based sensor data to a mobile device application. Mobile development uses a different paradigm compared to web development specifically when displaying graphs, charts and maps. Challenges involved in translating a website interface to a mobile application include the smaller screen sizes, the different user interaction and navigation of the interface, and the limited storage and processing resources on mobile devices. Mobile applications allow developers to take advantage of specific features of mobile devices, such as the GPS, to provide users with personally relevant information and a more convenient interface for their irrigation systems and more sustainable watering habits.

The Use of Internet Marketing by Independent Restaurants in Kelowna

Student: Jessica Weeres

Supervisor: Ramon Lawrence (Computer Science)

The over 150 independently-owned restaurants in Kelowna serve both locals and tourists and help define the Okanagan's culinary reputation. Many have a small marketing budget and rely on word-of-mouth to attract customers. Internet marketing – which is relatively cheap compared to traditional marketing – could be a useful tool for these restaurants. However, most do not take full advantage of its power. This research determined how independent restaurateurs in Kelowna use the internet to market their business and why some are more successful at it than others. The results showed that many owners feel they lack the time or skills to implement an internet marketing strategy. To challenge this conception, I worked with the owner of an independent restaurant to develop an internet marketing strategy that did not require specialized skills or a significant amount of time to maintain.

IKBSAS Undergraduate Research Conference
Oral Presentation Schedule - Session 4 – ASC 273
Wednesday, April 4, 2012

Session	First Name	Last Name	Presentation Title	Time
4	Alysha	Baker	Will Get Fooled Again: Emotionally Intelligent People are Easily Duped by High-Stakes Deceivers	1:20 - 1:40
4	Scott	Emerson	Attitudes toward Aging: The role of Personality, Empathy, and Gratitude	1:40 - 2:00
4	Kerry	Erickson	Who's to blame? Gender differences and gender role attitudes influence victim blaming in intimate partner violence.	2:00 - 2:20
4	Crystal	Evanoff	The Influence of Presentation Modality on Deception Detection Accuracy	2:20 - 2:40
4	Husan	Jan Khan	The Influence of Print Media on Attitudes About Suicide: An Evaluation of the Effectiveness of Media Guidelines	2:50 - 3:10
4	Natasha	Korva	Nonverbal and Verbal Cues to Differentiate between Psychopaths and Non-Psychopaths	3:10 - 3:30
4	Sarah	McQuaid	Detecting Plea Veracity: Verbal Cues to Deception in Real-life high-stakes ties	3:30 - 3:50
4	Michael	Wafler	The Muscle Effect: An examination of suspect muscularity and eyewitness identification	3:50 - 4:10
4	Allison	Wormell	The "Gendered Rotten Apple": Understanding the Social Contexts of Gender in Cases Involving Police Misconduct	4:10 - 4:30

Will Get Fooled Again: Emotionally Intelligent People are Easily Duped by High-Stakes Deceivers

Student: Alysha Baker

Supervisor: Stephen Porter & Leanne ten Brinke

There is major disagreement about the existence of individual differences in deception detection or naturally-gifted detection “wizards” [see O’Sullivan & Ekman (2004) vs Bond & Uysal, 2007]]. This study aimed to elucidate the role of a specific, and seemingly relevant individual difference - emotional intelligence (EI) and its sub-components - in detecting high-stakes, emotional deception. Participants ($N = 115$) viewed a sample of 20 international videos of individuals emotionally pleading for the safe return of their missing family member, half of whom were responsible for the missing person’s disappearance/murder. Participants judged whether the pleas were honest or deceptive, provided confidence ratings, reported the cues they utilized, and rated their emotional response to each plea. EI was associated with over-confidence in assessing the sincerity of the pleas and greater self-reported sympathetic feelings to deceptive targets (enhanced gullibility). Although total EI was not associated with discrimination of truths and lies, the ability to perceive and express emotion (a component of EI), specifically, was negatively related to detecting deceptive targets (lower sensitivity (d')). Combined, these patterns contributed negatively to the ability to spot emotional lies. These findings collectively suggest that features of emotional intelligence, and subsequent decision-making processes, paradoxically may impair one’s ability to detect deceit.

Attitudes toward Aging: The role of Personality, Empathy, and Gratitude

Student: Scott Emerson

Supervisor: Linda Allan

Ageism occurs where individuals are prejudiced, stereotyped, and discriminated against due to their older age – despite the inherent paradox that perpetrators of ageism are essentially prejudicing against their future selves. Compared to racism and sexism, ageism is a vastly under-investigated form of prejudice; hence, there is a need to expand upon current understanding of the nature of ageism and attitudes toward aging. Prior studies have examined links between personality and anxiety about aging; however additional investigation is required to further establish and develop this link. Also, more research is needed to investigate ageism by honouring the uniquely paradoxical nature of ageist attitudes e.g. empathy (perspective-taking). In the present study we anticipated that personality, gratitude, and – especially – empathy would have significant links to ageism. Through surveying a sample of undergraduate students, the present investigation examined the links ageism has with personality, gratitude, and empathy.

Who's to blame? Gender differences and gender role attitudes influence victim blaming in intimate partner violence.

Student: Kerry Erickson

Supervisors: Zach Walsh and Jennifer Langille

Victim blaming is the tendency to attribute blame to individuals who experience negative outcomes for which they are not primarily responsible. Victim blaming is particularly salient in intimate partner violence (IPV) and may play a role in the underreporting of IPV among victims. This documented phenomenon occurs among traditional victims (i.e. females), and as such, is likely to also be particularly relevant among non-traditional victims (i.e. male, same-sex), but little is known about whether this occurs. We examined attitudes towards victims and perpetrators of IPV across victim and perpetrator gender. Vignettes describing hypothetical IPV situations were presented to 107 university students, with victim and perpetrator genders varied across four conditions. Each participant was asked to attribute relative blame to perpetrator and victim in one of the four conditions. They also completed measures of gender role attitudes towards women, men, and gender overall, and we examined participants egalitarian versus traditional attitudes. Blame attribution did not differ across vignette couple type. Traditional gender roles were associated with higher levels of victim blaming across conditions; for male roles $r = .20$, $p < .05$, for female roles, $r = .25$, $p < .01$. Disaggregated examination by couple composition indicated that female roles were associated with blaming male victims of female perpetrated violence $r = .49$, $p < .05$, whereas blaming male victims of male perpetrated violence was associated with both female roles, $r = .44$, $p < .01$, and male roles, $r = .37$, $p < .05$. Results indicate that traditional gender role attitudes are associated with victim blaming, and that these relationships differ according to victim gender.

The Influence of Presentation Modality on Deception Detection Accuracy

Student: Crystal Evanoff

Supervisors: Stephen Porter, Pamela Black

Deception is a pervasive social phenomena that is prevalent in all forms of social interaction. Although people are deceived on a daily basis, they are only able to detect deception at the level of chance (Bond and DePaulo, 2006). However, previous research using low-stakes, experimentally-derived lies has demonstrated that the way a lie is presented may improve deception detection accuracy. The purpose of the current study was to investigate whether this relationship was also present with high-stakes, emotional lies. These high-stakes lies took the form of televised emotional pleas ($N = 20$) for the safe return of, or information regarding, a missing family member. Of these 20 pleaders, 10 were genuine and 10 were deceptive (i.e., involved in the disappearance). To determine whether the way in which a lie is presented to an individual affects the accuracy of their determination of deception, undergraduate students ($N = 154$) were randomly assigned to one of four presentation modalities: video only, audio only, audio and video, and transcript only. Analysis of the resultant data found that the sample overall, not accounting for the independent conditions, had an overall deception detection accuracy rate slightly above chance (52.5%). In addition, there were no significant differences in overall accuracy between any of the four presentation modalities – all groups detected deception at approximately the level of chance. Although there were no significant differences found between groups for overall accuracy, further analyses revealed that participants in the transcript-only condition exhibited a higher level of truth bias than the other three conditions; this led to an

increased level of truth accuracy among the transcript group. Finally, participants in all four presentation modality conditions reported the same level of subjective confidence regarding their accuracy ratings. These findings may be relevant to understanding the factors that affect deception detection, which may have serious consequences in forensic settings.

The Influence of Print Media on Attitudes about Suicide: An Evaluation of the Effectiveness of Media Guidelines

Student: Husan Jan Khan

Supervisor: Carolyn Szostak

The reporting of suicides by the media can adversely affect people's attitudes and behaviour. These stories are often very dramatic, reinforcing the stigma that surrounds suicide. To minimize these effects, media guidelines have been developed by several mental health/suicide prevention agencies. For example, it is recommended that stories avoid sensationalizing suicide and not include details about the method used. The inclusion of educational information and resources is also recommended. The present study evaluated the effectiveness of these guidelines in decreasing suicide-related stigma using a 3x2 between-group design: Style (i.e., No Article, Pre- vs. Post-Guideline Articles) and Educational Sidebar (i.e., No Sidebar vs. Sidebar). Both articles were written for purposes of this study, and concerned the same fictional case of suicide. They differed only in terms of style and content (e.g., sensationalistic or not; method/no method). The acute effects of these articles/sidebars on mood, social distancing, and attitudes about suicide were evaluated in undergraduates (n = 271). The data are being analyzed using multivariate analyses of variance/covariance. It is predicted that the two factors will interact, such that the Pre-Guideline Article/No Sidebar group will report the most stigmatizing attitudes while the Post-Guideline Article/Sidebar group will have the least. If these results are obtained, they may help to promote compliance with available media guidelines, resulting in more socially responsible media coverage of suicide. In turn, a reduction in stigma may occur, making it easier for individuals who are at risk for suicide to seek help.

Nonverbal and Verbal Cues to Differentiate between Psychopaths and Non-Psychopaths

Student: Natasha Korva

Supervisor: Dr. Stephen Porter

Psychopaths are predatory individuals who use charm, intimidation and violence to gain control over others and satisfy their needs. They are able to persuade legal professionals into handing down shorter sentences and allowing conditional releases despite their high risk of re-offending (e.g., Porter, ten Brinke, & Wilson, 2009). Although observers can accurately infer levels of psychopathic traits during very short interactions (Fowler, Lilienfeld, & Patrick., 2009), the ability to do so decreases with increased exposure, potentially due to impression management strategies by the offender. The current study was the first to examine in detail communication styles of psychopaths relative to non-psychopaths (facial expressions, body language, and speech). Some of the key findings include heightened positive and negative emotions in the upper face, increased illustrator use (i.e., hand movements), and the use of more filler words (e.g., words irrelevant to the conversation). This research provides basic insight into psychopathic behavioural styles and has implications for understanding psychopathic manipulation of others.

Detecting Plea Veracity: Verbal Cues to Deception in Real-life high-stakes ties

Student: Sarah McQuaid

Supervisor: Dr. Michael Woodworth

Deception is an integral aspect of human social interaction, and we are, in fact, much better liars than we are lie detectors. However, language can potentially reveal a great deal about an individual, including whether or not they are lying (see Porter et al., 2008; Vrij et al., 2004). Automated language analysis programs are particularly useful in cases where aspects of language use are not easily measurable by human coders. The current study has used the Dictionary of Affect in Language (DAL; Whissell & Dawson, 1986), the Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis, & Booth, 2001), and the Wmatrix (Rayson, 2008) to investigate language use in a sample of 85 individuals who were pleading for the return of a missing loved one during an official televised press conference. Subsequent information has revealed that approximately half of these individuals were being deceptive and had caused the disappearance. Transcripts of the pleas have been coded for a variety of linguistic properties such as emotional intensity, past-tense slip ups, and optimism. Results are expected to show important linguistic differences between liars and truth tellers, demonstrating that liars are unable to control all aspects of their language that may be indicative of deception. The results of the current study could be of considerable use to law enforcement agencies and the judicial system.

The Muscle Effect: An examination of suspect muscularity and eyewitness identification

Student: Michael Wafler

Supervisor: Dr. Stephen Porter

Bias enters the legal system at various stages, where it directly contradicts the fairness of the legal enterprise. Therefore, it is crucial to identify the origins of this bias so that it may be remedied. Body shape is often overlooked as a basis for discrimination, and has rarely been examined as a source of bias in a criminal context. Our aim was to expand on research regarding stereotypes in psychological-legal contexts by examining the impact of suspect muscularity on eyewitness line-up identification (guilt presumption). In a real-world lineup procedure, a witness to a crime observes a group of suspects in an attempt to identify the true perpetrator. In this study, participants viewed one of two mock-crime video scenarios (i.e., violent or non-violent) and then attempted to identify the perpetrator from a photographic lineup. Unbeknownst to participants the true perpetrator was not present in the lineup, forcing a false identification. Body type was manipulated for each photographic suspect into muscular, average, and obese conditions. It was hypothesized that the more muscular a suspect was, the more likely they would be deemed responsible of an offence despite inadequate evidence, especially when charged with violent offences. Hierarchical loglinear analysis was utilized to analyze the relationship between crime severity and suspect body type. Additional analysis was conducted to determine specific differences between body type selected. Results indicated that regardless of the type of crime, muscular suspects were falsely identified more often than average weight suspects, who were identified more often than obese suspects. Our research draws attention to the many sources of bias that unfairly influence legal decision making, and has the potential to inform legal decision-makers and encourage eyewitness neutrality.

The “Gendered Rotten Apple”: Understanding the Social Contexts of Gender in Cases Involving Police Misconduct

Student: Alison Wormell

Supervisor: Christopher Schneider

This exploratory research investigates the social contexts of news media reports of police misconduct. I illustrate how gendered meanings shape how female officers are portrayed in select news reports. This project focuses on an ongoing RCMP misconduct case in published news reports involving an on duty affair between Constable Susan Gastaldo and Staff Sergeant Travis Pearson. Using Qualitative Document Analysis (QDA), I collected, sampled, and examined news reports from Canadian Newsstand, a document database with complete access to nearly 300 newspapers and thousands of articles from across Canada. Drawing from sampled news reports, I elucidate how news media frame Constable Gastaldo in one of two ways: 1) as either a helpless, vulnerable victim (*victim frame*), or; 2) or as an unstable, crazed accuser (*accuser frame*). I refer to this collectively as the gender binary frame. My analysis shows how early reports of the misconduct case are consistent with the victim frame, however, the introduction of themes consistent with infantile behaviour and mental illness serve as the catalyst for the shift to the accuser frame. Building on the “rotten apple” argument (Sherman, 1978), I illustrate how my research provides empirical evidence of a “gendered rotten apple”: which I argue both distances the police institution from negative criticism, while simultaneously preserving the dominant normative patriarchal structure. Suggestions for future research will be noted.