School of Pharmacy

2018 Annual Research Poster Competition

ABSTRACTS
Undergraduate Abstracts
Alpha-2C Adrenergic Receptor Expression in Rat Caudal Tail Arteries

Kayla Kitselman1, Noriko Daneshtalab2, Reza Tabrizchi3

Department of Biochemistry1, School of Pharmacy2, Division of Biomedical Sciences, Faculty of Medicine3, Memorial University of Newfoundland

Introduction: The rat caudal tail artery has been shown to be thermoregulatory and innervated by the sympathetic nervous system; in response to cold environments the caudal tail artery would remain dilated to increase blood flow. Alpha 2-adrenergic receptors are G-protein coupled receptors that are primarily neuronal in origin. They are shown to change its location in the cell in response to changes in temperature. Our objective was to determine whether alpha-2C adrenergic receptor regulates vascular tone and thus be involved in thermoregulation in the rat caudal tail arteries. We hypothesized that changes in alpha-2C adrenergic receptor expression plays a role in the thermoregulatory mechanism controlling rat caudal tail arteries. **Hypothesis:** Alpha-2C adrenergic receptor expression would be higher at 24°C compared to 37°C.

Materials and Methods: Sprague Dawley rats (SDR) were sacrificed and their caudal tail arteries were collected and incubated ex vivo in Krebs buffer at 24°C or 37°C for one hour. The samples were then fixed and blocked in paraffin. 6 µm sections of the samples were cut then placed on positively charges glass slides for immunofluorescence experiments to stain for alpha 2C receptors. Upon staining, confocal imaging was performed using Fluoview 1000. The images were then semi-quantified using ImageJ with FIJI plugin and the mean grey value of the area outside of the vascular smooth muscle of the images was used for semi-quantification.

Results and Discussion: Qualitative analysis showed increased expression of alpha-2C adrenergic receptors in 24°C samples compared to 37°C samples. Semi-quantification and statistical analysis of the images showed a significant difference (p<0.05) in the alpha-2C adrenergic receptor expression between the two sample groups (n=4/group).

Conclusion: Alpha-2C adrenergic receptor expression is increased at colder temperatures in rat caudal tail arteries, correlating with research from our lab showing rat caudal tail arteries dilate at colder temperatures. This data supports the idea that alpha-2C adrenergic receptors are likely involved in the thermoregulatory mechanism of rat caudal tail arteries.
Introduction: Microtubules are an essential component to the cell’s cytoskeleton, without which would make simple cell functions like the transportation of organelles and division impossible. That is why tubulin, the components that make MTs, is an ideal anticancer target. Both α- and β-tubulin have been targeted effectively, but why not γ-tubulin? Recently it has been shown that TUBG1, a γ-tubulin isoform, is overexpressed in glioblastoma multiforme (GBM) and multiple breast cancers. This forecasts a promising pathway to target, especially since current GBM treatments are ineffective.

Material and Methods: We have made modifications to known tubulin structures in-house by completing and simulating the missing segments in the crystal structure of MT subunits. I applied the GROMOS96 (G53a6) force field to add hydrogen atoms as well as account for Lennard-Jones and electrostatic interactions. This updated model is then defined inside a box and then filled with water molecules and ions. This allows the system to be well solvated as it would be naturally as well as begin without a charge. To achieve subunits conformations close to global minimum energy on the free energy landscape.

I applied an energy minimization algorithm. I also applied restraining forces on the heavy atoms of the proteins. This allowed the solvent to be free to interact around the tubulin structure without major changes occurring within the protein. Now that the system was well equilibrated with temperature and pressure the position restraints were released and data collection began. Although this simulation only collects data for a couple hundred of nanoseconds it takes multiple dedicated CPUs weeks to months on High Performance Computer Clusters that became available to us via Compute Canada.

Molecular dynamics simulations were performed on the Graham Supercomputer in Ontario. All simulations were performed using the GROMACS package 2016.3 applying periodic boundary conditions. For Lennard-Jones and the electrostatic interactions, 1.4 nm cutoff distances were applied. The Particle Mesh Ewald (PME) algorithm was used for the calculation of electrostatic contributions to energies and forces. Bond lengths were constrained using the LINCS algorithm, as well as constrain hydrogen bond lengths. The dynamics simulations of each tubulin structure used in this study were first energy minimized using a steepest descent algorithm. Next, an all-bond progression of position restraint was performed for 0.5 ns. A dynamics simulation was carried out at the next phase to gradually release all the constraints in each system for 200 ns.

Results and Discussion: The Molecular Dynamics trajectories of tubulin subunits are currently being analyzed.

Conclusion: The tubulin conformations from MD simulations will provide insight for mechanism of MT nucleation and binding sites to investigate for designing novel stabilizer/destabilizer anti-mitotic agents. The MD trajectories consisting millions of tubulin subunits conformations will take several months to analyze and it is not feasible to present any findings at this time with the time restraints of the 12-week USSRP.
Promoting Youth Mental Health and Well-Being through a Community-based Music Program

Hilary Power\textsuperscript{2}, Dr. Lisa Bishop\textsuperscript{1}, Dr. Stephen Darcy\textsuperscript{3}

School of Pharmacy\textsuperscript{1}, Department of Psychology\textsuperscript{2}, and Faculty of Medicine\textsuperscript{3}, Memorial University of Newfoundland

Introduction: The recent 2017-2018 survey conducted by NL Support identified several themes that the people of Newfoundland and Labrador (NL) determined to be of importance to healthcare in the province. The need for mental health services and preventative care were in the top three health priorities that should drive the future health care in NL. Mental health conditions and substance use can emerge at a very young age, having a negative effect on motivation and cognitive processes, and increasing the risk of injury and death. Prevention programs that target youth early in life have an opportunity to significantly influence the mental health of future adult. One innovative way to promote mental health in youth is through extracurricular music programs. Research has shown that benefits are gained from having musical involvement, including increasing self-esteem and improving overall well-being. The Strong Harbour Strings music program is a social community-based music program that offers youth a transformative learning experience through music. Increasing self-esteem and promoting mental health and well-being may be achieved through providing this music program to children.

Research Objectives: The overall goal of this project is to assess the effectiveness of active participation in an innovative music program on childhood self-esteem and resilience as an indicator of mental health. The specific objectives of this project are to assess the effect of the music program intervention on childhood self-esteem, well-being, and resilience, as well as to evaluate the music program and compare an existing program with a new satellite program.

Methods: Youth in grades 1 to 7 who are enrolled in the music program will be invited to participate in the study. Youth will complete surveys pre-music program intervention and post-music program intervention to measure self-esteem/well-being and resilience. Parents will also complete surveys pre-music program intervention and post-music program intervention to measure their child’s resilience. Youth and parents will also complete a survey measuring their satisfaction with the music program.

Implications: Implementing an innovative and cost-effective music program may improve self-esteem and resilience, helping to promote overall mental health and well-being. This arts-based approach may be translated to other communities. This research will also add to the literature on arts in primary healthcare and the impact of the social determinants of health.
Evaluation of the Newfoundland and Labrador Antibiotic Adherence Program: Phase II – Survey Development and Design

Steven A. Rowe, Dr. Tiffany Lee, and Dr. Beverly Fitzpatrick
School of Pharmacy, Memorial University of Newfoundland

Introduction: The Newfoundland and Labrador Antibiotic Adherence Program (AAP) is a novel initiative through which pharmacists receive financial reimbursement to emphasize the importance of antibiotic adherence to patients, and follow-up with patients regarding their antibiotic therapy. This study aims to develop a survey instrument and study design to generalize results from Phase I, a series of interviews investigating perceptions of the AAP.

Methods: A survey instrument was developed using common themes from interviews with pharmacists, student pharmacists, and pharmacy managers/owners during Phase I. The survey instrument was field tested on pharmacists and student pharmacists (n=7) for validation. Next, a study design was created to generalize results of Phase I to the pharmacist population of NL.

Results: Four overarching sections were included in the survey based on common themes from Phase I interviews: 1) challenges and enabling factors for implementing the AAP, 2) benefits of the AAP, 3) uptake and feasibility of the AAP, and 4) ways in which the AAP may be improved. A cross-sectional survey study was designed and an ethics application submitted to NL HREA.

Conclusion: No study to date has documented the perceptions of pharmacists regarding the AAP, a novel pharmacist-driven program funded by the NL government. A survey instrument and cross-sectional study design were created to assess perceptions of NL pharmacists pertaining to the AAP. The study is presently pending ethics approval.
Human Thymidine Phosphorylase Complexed with 5-Fluorouracil

Tiffany Tozer, Kali Heale, and Laleh Alisaraie

School of Pharmacy, Memorial University of Newfoundland

Introduction: 5-Fluorouracil (5-FU) is a medication often given intravenously to treat both colorectal cancer and cancers of the aerodigestive tract. Human thymidine phosphorylase (hTP) is involved in pyrimidine nucleoside metabolism, affecting tumour growth and angiogenesis. The present investigation aimed to determine the molecular dynamic structure of hTP in complex with 5-FU.

Materials and Methods: Four systems of hTP were investigated: unliganded monomer, unliganded dimer, monomer liganded with neutral 5-FU, and monomer liganded with protonated 5-FU. Protein structures/complexes in each system were placed in a pre-equilibrated water box. MD simulations were performed using 53A6 GROMOS force field of Gromacs package.

Results and Discussion: An important segment of hTP contributing to the stabilization of 5-FU-bound hTP and its dimer structure was identified. In the drug-bound monomeric systems, the protein segment interacted with residues across the 5-FU binding site. Intra- and inter-chain interactions were observed in the unliganded dimeric system.

Conclusion: MD simulations of a drug-protein system can be used to identify key protein regions involved in drug binding, such as the stabilizing segment identified in hTP. This information can be further utilized in drug discovery.
Potential neuroprotective effects of wild blueberries: a pilot study

Rachel Ward1, Erin Kelly1, Poorva Vyas1,2, Andre Igamberdiev2, and John T. Weber1

School of Pharmacy1 and Department of Biology2, Memorial University of Newfoundland

Introduction: Parkinson’s disease (PD) is a common neurodegenerative disorder characterized by progressive loss of dopaminergic neurons in the substantia nigra and Lewy bodies found in the brain post-mortem (Lücking & Brice, 2000). PD results in debilitating motor dysfunction and cognitive symptoms. Although PD responds well to traditional therapy with levodopa, treatment only controls symptoms and does not prevent progression or cure the disease. Although the pathogenesis of PD remains largely unknown, glutamate excitotoxicity and production of alpha-synuclein are two mechanisms implicated in the disease (Lau & Tymianski, 2010; Majláth & Vécsei, 2014). Glutamate is the major excitatory neurotransmitter in the central nervous system (Lau & Tymianski, 2010). However, excess glutamate causes neuronal degeneration, such as that seen in PD. As a major component of Lewy bodies, alpha-synuclein has also been linked to PD (Lücking & Brice, 2000). Alpha-synuclein forms Lewy bodies when it aggregates and becomes insoluble, and it is also toxic as a soluble oligomer. Glutamate excess and alpha-synuclein can also activate microglia, which release reactive oxygen species, ultimately leading to death of neurons (Block et al., 2007).

Blueberries and their leaves are high in polyphenols which act as antioxidants (Vyas et al., 2013). Antioxidants are potent free radical scavengers and may exert neuroprotective effects by helping to clear reactive oxygen and nitrogen species, thus reducing inflammation and neuronal degeneration. We have found that blueberry extracts protect cultured neurons and microglia from glutamate and alpha-synuclein exposure. The current study is a pilot experiment aimed at testing the effects of a blueberry fruit-enriched diet in wild-type mice, before testing the effects of a berry-enriched diet in mouse models of PD.

Methods and Materials: Wild-type mice were fed mash composed of powdered rat meal and water for 4.5 weeks (August 8th to September 10th, 2017). The control group received 5 g plain mash each day. The experimental group received 5 g mash with 2% w/w wild blueberry fruit each day. Mice were isolated and fed the mash overnight without any pellets present. During the day, they had free access to pellets. We used blueberries collected 02/09/2016 and frozen for our study, as we knew their antioxidant content and could be assured it was of a high level.

During the period of feeding, the mice completed rota rod testing twice weekly at 5, 10, and 15 rpm following two initial days of training. Three trials were done at each speed for each mouse. The time a mouse stayed on the rota rod (their latency to fall) was recorded. This provided us with a quantitative value for the balance of each group. Following completion of the feeding, all mice completed a novel object recognition test to quantitatively assess their non-spatial memory using a discrimination index.

Results and Discussion: Both groups displayed significant weight gain at the end of the study, indicating the mash was palatable long term. Although there were no significant differences
between the control and experimental group data for rota rod or novel object recognition, a trend in differences can be seen. In both tests, the experimental group outperformed the control group.

**Conclusion:** Blueberries and their leaves are high in antioxidants, and could be used therapeutically in neurodegenerative diseases in the future to prevent progressive neuronal degradation. A blueberry-enriched mash is palatable to mice and therefore could be used in a long-term study evaluating the neuroprotective effects of blueberries in a mouse model of PD. There is also potential for further research evaluating if blueberries provide a motor or cognitive benefit in individuals of normal health.
Graduate Abstracts
Chemical and Pharmacological Investigation of Whole Plant of *Callistemon citrinus* (Curtis.) (Family: Myrtaceae)

Farhana Ahmed¹, Dr. Md Sharifur Rahman²

¹School of Pharmacy, Memorial University of Newfoundland
²Department of Pharmaceutical Chemistry, University of Dhaka

This dissertation describes the isolation and characterization of secondary metabolites from the whole plant of *Callistemon citrinus* (Curtis.) (Family: Myrtaceae), as well as different bioactivities of the crude methanolic extracts and its different partitionates: petroleum ether, carbon tetrachloride, chloroform and aqueous soluble fractions. A total of six compounds were isolated, which were characterized by extensive analysis of their high resolution ¹H-NMR spectroscopic data. The chemical investigations includes extraction of the dried powdered plant materials with methanol followed by partitioning into petroleum ether, carbon tetrachloride, chloroform and aqueous soluble fractions by modified Kupchan partitioning method. The chromatographic separation by gel permeation chromatography of carbon tetrachloride fraction of whole plant of *C. citrinus* followed by extensive TLC screening and preparative TLC yielded three pentacyclic triterpenes CC-1 (5), CC-2 (6) and CC-3 (7). The chromatographic separation by VLC of methanolic extract of *C. citrinus* followed by gel permeation chromatography of VLC fractions yielded the compound CC-4 (8), a flavonoid CC-5 (9), a triterpene and CC-6 (10) a glucoside.

The extractives of *C. citrinus* were subjected to various biological screenings such as thrombolytic, antioxidant, brine shrimp lethality, antimicrobial, membrane stabilizing, peripheral and central analgesic, hypoglycemic and antidiarrhoeal activities. The result varies depending on the fractions. Some data have been found as statistically significant. This study was only preliminary screening. Further comprehensive investigations are required to explore the detailed chemical profile and unwrap the mechanism behind the bioactivities.
Perceptions of COPD patients and their health care providers regarding a mHealth intervention to manage COPD: a Mixed Methods Study

Meshari F. Alwashmi¹, BN, MSc; John Hawboldt, PharmD; Erin Davis, PharmD; Gerard Farrell, MD; Beverly FitzPatrick, PhD; JM Gamble, PhD; Jamie Farrell MD, FRCPC; Hai Nguyen PhD.

School of Pharmacy¹, Memorial University of Newfoundland

Introduction: The prevalence and mortality rates of Chronic Obstructive Pulmonary Disease (COPD) are increasing worldwide. Therefore, COPD remains a major public health problem. Although there are effective and inexpensive treatments to COPD, adherence rates are amongst the lowest of all chronic diseases, leading to avoidable adverse medical outcomes, costs, and reduced quality of life. Using a Mobile Health (mHealth) intervention, a smartphone and compatible medical device, have the potential to enhance COPD treatment outcomes while mitigating health care costs. We aim to understand the perceptions of COPD patients and their health care providers regarding smartphone use in COPD management. In addition, we will assess the use and access to smartphones in patients with COPD.

Methods/Design: This is a mixed methods explanatory sequential study (quantitative component followed by a qualitative component). Participants will be recruited during routine visits to their respirologists at outpatient respirology clinics in the Eastern Health Regional Health Authority of the province of Newfoundland and Labrador, Canada.

Participants (n=200) will complete a questionnaire regarding smartphone usage and access. Then, some participants may be invited to participate in a focus group (n=24) or an interview to understand their perceptions regarding the use of mHealth in COPD management. It will also help us understand the facilitators and barriers for mHealth uptake. Participants will provide insight regarding the features and medical devices that may be beneficial for an mHealth intervention for COPD management.

In addition, we will recruit Health Care providers (HCPs) who interact with COPD patients via email. Health providers will include pharmacists, physicians, respirologists, and nurses. We will interview HCPs to understand their perceptions regarding the mHealth intervention.

Discussion: mHealth interventions may empower patients to manage their own health and also potentially enable them to participate more actively in shared decision-making with their health care providers to optimize their COPD control and medication adherence. Given that medication adherence in patients with COPD is critical to positive health outcomes, a usable mHealth intervention with high user satisfaction and retention could have a significantly positive effect on...
adherence rates resulting in improved health outcomes, quality of life and reduced overall health care costs.

**Conclusion:** While patients express interest in using technologies for self-management, the majority of current tools are not usable. mHealth involves the interaction between multiple user groups through a system, making the usability aspect of such system crucial for the continuous, efficient and satisfactory use. Researchers recommend frequent and iterative usability testing to respond to the users’ preferences, technical issues, and shortcomings which could potentially limit attrition. The findings from this study will help to guide the development of a mHealth prototype that aims to manage COPD.
Introduction: Recent insights into the developing brain of the emerging adult (age 18-25), as well as the high incidence of substance abuse in this population, requires emerging adults to be regarded as a distinct developmental group. Research on the best treatment for emerging adults is limited. In order to optimize services for emerging adults, there needs to be a better understanding of what treatment interventions work best for this population.

Methods: Using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic literature search was conducted to identify studies evaluating treatment interventions for emerging adults with substance use disorder with an overall outcome of retention in treatment over time. Treatment retention is determined by the number of days a participant remains in a treatment program. A patient is considered to have completed treatment if they remained in the program for the entire duration of the study.

Results: The key finding from the qualitative analysis indicate that effective treatment for emerging adults with substance use disorder include behavioural therapy such as cognitive behavioural therapy, motivational enhancement therapy, contingency management therapy, and peer-enhanced therapy. The most effective pharmacotherapy for emerging adults with substance use disorder include antagonist (e.g., naltrexone) medications or agonist medications (e.g., buprenorphine) in sufficient doses for opioid use disorder.

Conclusion: This systematic review provides an understanding of features of addiction treatment programs for emerging adults (age 18-25) that promote retention in treatment. This evidence is promising given the need for targeted treatment for this population as the field of addiction medicine has a lack of consensus for the most effective treatment for the emerging adult population.
Background: The sodium glucose co-transporter-2 (SGLT2) inhibitors, used for the management of type 2 diabetes (T2D), work using a novel mechanism of action of preventing glucose reabsorption in the kidney and increasing urinary glucose excretion. It is believed that the increase in urinary glucose leads to higher risk of urinary tract infections (UTI).

Methods: A Bayesian network meta-analysis of randomized controlled trials (RCT) was conducted to examine the dose-response relationship of the SGLT2 inhibitors on risk of UTI in patients with T2D. The comprehensive literature search included five database searches, as well as reviewing references of key papers. Studies with placebo or active comparators were included. Each of the SGLT2 inhibitors were categorized into a high or low dose groups. A random effects model using the generalized linear model was used to estimate the pooled effect estimates.

Results: We screened 1857 citations of which 576 relevant abstracts were identified and 92 references (representing 96 RCTs of 8 unique SGLT2 inhibitors) were finally included. Most pair-wise comparisons showed no significant difference in risk of UTI with the exception of high dose dapagliflozin (≥10mg). High dose dapagliflozin was shown to have a higher risk when compared to placebo (OR: 1.31, 95% CI 1.56, 1.09), active comparators (OR 1.36, 95% CI 1.09, 1.72) and empagliflozin at both low (OR: 1.28, 95% CI 1.60, 1.03) and high (OR: 1.38, 95% CI 1.71, 1.12) doses.

Conclusions: Current evidence from RCTs does not suggest an increased risk of UTIs with most SGLT2 inhibitors with the exception of doses of dapagliflozin 10mg or greater.
Effectiveness of Cognitive Behavioural Therapy Versus Combination Therapy in the Treatment of Binge Eating Disorder: A Systematic Review and Meta-analysis

Brittany Howell¹ and Lais Masullo²

School of Pharmacy¹, Memorial University of Newfoundland and Federal University of Ceara (UFC)², Brazil

Introduction: Binge eating disorder (BED) is a prevalent and harmful eating disorder that is associated with obesity as well as high rates of biological, psychological, and social distress. Research shows that cognitive behavioural therapy (CBT) has shown promise in treating the symptoms of BED, however the most effective treatment for BED is still being explored.

Methods: A systematic review and meta-analysis comparing CBT to a combination of CBT and pharmacological treatments in the treatment of BED was conducted. The primary outcome explored was remission which was determined by whether participants withheld from binging during treatment. Secondary outcomes included scores on eating disorder questionnaires, binge eating frequency, body mass index, and scores on depression inventories. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA).

Results: Seven studies met inclusion criteria and were included in the systematic review and meta-analysis. The data collected from these studies demonstrated no significant difference in remission according to treatment of BED. In the secondary outcomes, there was a treatment effect favoring CBT and pharmacology over CBT for reducing scores on eating disorder questionnaires. However, all other secondary outcomes showed no treatment effect, suggesting the combination of CBT with drug therapies was no more effective than CBT in treating symptoms of BED.

Conclusion: This systematic review and meta-analysis aimed to identify whether adding pharmacotherapy to CBT improved effectiveness compared to CBT in treating symptoms of BED. Findings suggest that combining CBT with a pharmacotherapy is no more effective in treating the symptoms of BED than CBT alone in outcomes of remission, binge frequency, BMI, and depression scores. Combination therapy did significantly reduce eating disorder scores, however, more studies are needed directly comparing CBT to combination therapy to further verify the results present in this review.
Effect of polyphenols on markers of neurodegenerative disease

Erin Kelly¹, Poorva Vyas¹,², Rachel Ward¹, Andre Igamberdiev², and John T. Weber¹

School of Pharmacy¹ and Department of Biology²

Introduction: Currently, there is no cure for neurodegenerative diseases (NDD) such as Parkinson’s, Alzheimer’s, and Huntington’s disease. There are drugs and therapies available but they only help to relieve the symptoms of the disease and have no effect on its pathology. It has been suggested that one of the main mechanisms of neurodegeneration is from the increased and long-term effects of oxidative stress (Ataie et al., 2016; Strathearn et al., 2014). Disruption of the sensitive regulation of reactive oxygen species and balance of antioxidants can lead to cell death and damage.

Neuroinflammation is also accredited to causing many chronic NDD. Microglia in the brain are innate immune cells that play a role in neuroinflammation. Aggregates of alpha-synuclein discharged from dead or dying neurons can activate microglia causing them to release inflammatory mediators (Block et al., 2007). Targeting these microglia could offer new ways to combat neurodegenerative diseases. Neurodegeneration is also linked to glutamate-mediated excitotoxicity, which is a pathological process by which cells are damaged and killed by excessive stimulation from glutamate via inadequate uptake by glia cells (Vyas et al., 2013).

Polyphenols, present in many plants, are botanical nutraceuticals which have antioxidant properties as well as anti-inflammatory, anti-cancer, and anti-infective properties (Joseph et al., 1999). Some antioxidants are found in the body naturally while others need to be obtained in the diet. Blueberries have very high levels of antioxidants and polyphenols which may offer protection and intervention from neurological disorders by managing reactive oxygen species, reducing the inflammatory response, and providing protection in the brain from further degeneration (Papandreou et al., 2012).

Methods and Materials: Biochemical analysis was performed after the extraction of frozen wild Newfoundland berries and leaves, Vaccinium angustifolium spp., from four different locations. Biochemical assays consisted of total antioxidant activity, total phenolic content, and flavonoid, anthocyanin and tannin content. The study also investigates the neuroprotective role of the blueberry fruits and leaves in cell culture when mouse-pup brain dissections, and pure cultures of rat neurons and microglia are exposed to 100μM glutamate or 100ng/ml alpha-synuclein for 24-hours. Quantification of DAPI-stained nuclei (% control) is measured.

Results and Discussion: In this study, it was determined that the leaves contained significantly higher levels of phenolic compounds and a higher total antioxidant activity for all of the locations. Through biochemical analysis it was determined that both blueberry fruits and leaves contain high levels of polyphenols and exhibit neuroprotective effects. We have observed an increase in the number of viable cells once blueberry extract is added to cultures treated with 100μM glutamate or 100ng/ml alpha-synuclein.
Conclusions: The blueberry extracts have high antioxidant activity and contain high levels of phenolic compounds, and therefore may be able to help combat oxidative stress and neuroinflammation in the brain. The blueberry extracts are also able to provide significant protection compared to the control and effectively reduce neuronal and microglial cell death, showing that their presence helps when cell death and damage is influenced by glutamate-mediated excitotoxicity and/or insoluble alpha-synuclein aggregates.

References:


Binge drinking during adolescence causes persistent behavioral impairments and elevated pro-inflammatory proteins in a rodent model

*Matthew Lamont and John T. Weber*

School of Pharmacy, Memorial University of Newfoundland

**Purpose:** Binge drinking among adolescents is an ongoing public health concern. Although binge drinking can also be harmful to adults, the adolescent population is more susceptible to aberrant neurological changes as their brains are still undergoing significant development. The goal of this project is to provide firm evidence that there are changes occurring to cerebellar physiology, an area of the brain important for motor coordination and learning, after repeated episodes of binge drinking.

**Methods:** Groups of adolescent (PND 26) and periadolescent (PND 30) rats underwent a series of behavioral tests designed to assess memory, anxiety regulation, and motor function. Subjects were first exposed to either ethanol or plain air through a vapour chamber apparatus for five consecutive days (two hours per day); achieving a blood ethanol concentration equivalent to 5-6 drinks in the treatment group. Western blot experiments are also being conducted using tissue from either the cerebellum or cerebrum. These tests help to examine the role of NF-kB, PKC-gamma, and caspase-3 (proteins associated with inflammation and cell death) in this model.

**Results:** Behavioral testing using the rota-rod, cage-hang, novel object recognition, light-dark box, and elevated plus maze apparatuses showed significant differences between the groups. Interestingly the effects persisted for up to 60 days after treatment. Both age groups displayed a similar susceptibility to the effects of ethanol exposure. Western blot testing indicated significantly higher levels of the caspase-3 pro-inflammatory protein in the cerebella of ethanol exposed rats, but not in the cortical tissue. NF-kB was found to be elevated in both brain regions.

**Conclusion:** Behavioral testing shows that there are several potential long-term problems associated with adolescent binge-drinking. Differences on anxiety tests indicate a possible failure of behavioral inhibition in the treatment group leading to riskier behavior. There also seem to be impairments to motor coordination and object memory, which involve the cerebellar and hippocampal brain regions respectively. Protein quantification indicated the cerebellum is more susceptible to ethanol-induced inflammation than the cerebrum. These experiments indicate the potential dangers of binge-drinking while the brain is still developing and indicate the need for future studies in this area.
Pharmacist perceived barriers and facilitators to their role in medical assistance in dying, and their willingness to participate:

A systematic review protocol

Abigail Turner¹, Meshari Alwashmi¹, Jason Kielly¹, Erin Davis¹

School of Pharmacy¹, Memorial University of Newfoundland

Introduction: A systematic review will be conducted that focuses on what pharmacists see as the barriers and facilitators to their role in medical assistance in dying, and their willingness to participate. To get a better understanding of pharmacist’s willingness to participate, pharmacist’s attitudes and views towards medical assistance in dying will also be reviewed.

Methods: The following databases will be investigated: PubMed, EMBASE, PsycINFO, CINAHL, and IPA. A grey literature search through ProQuest Dissertations and Theses Global database and a search of the references of included studies will also be performed. Article selection will be guided by inclusion and exclusion criteria and conducted by two reviewers. The PRISMA 2009 flow diagram (Moher et al., 2009) will be used to guide and record article selection. A data extraction form specific for this review will be used to extract data.

Strategy for Data Synthesis: Depending on the data we find; a meta-analysis will be performed and a narrative synthesis of the findings. The narrative synthesis will be structured around study characteristics (including quality of studies), participant characteristics and study outcomes; willingness to participate in medical assistance in dying, barriers and facilitators to pharmacist’s roles in medical assistance in dying, general attitudes to medical assistance in dying, and any personal characteristics associated with their attitudes or participation in medical assistance in dying.

Implications: To our knowledge there has not been a systematic review conducted on this topic. This review may identify pharmacist perceived barriers and facilitators to their role in medical assistance in dying and their willingness to participate, which may influence policy development. This review may also identify any gaps in the literature or areas for future research.