

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Kowalec, Kaarina
Email:	Kaarina.kowalec@umanitoba.ca
Telephone:	204-272-3140
Title:	Understanding psychiatric comorbidity in chronic immunoinflammatory diseases using genomics
Number of students I would accept to work on this project:	1

Short Description of Research (250 words maximum):

Chronic immune-mediated inflammatory diseases (IMID), such as inflammatory bowel disease, multiple sclerosis, and rheumatoid arthritis, affect around 5% of Canadians. These conditions have a particularly high prevalence in Canada and are characterised by acute exacerbations and progressive disability. Management of these diseases involves immuno-modulatory and immunosuppressive drug therapies, although each disease may require unique drugs. The treatment goal for each disease is remission as these diseases are incurable. We aim to improve the understanding of the high burden of depression and anxiety in chronic IMID by investigating the biological susceptibility factors (polygenic risk scores, also known as genetic risk scores) that contribute to psychiatric comorbidity in IMID. We expect to gain knowledge about how genetic variation mediates the risk of psychiatric comorbidities in IMID which may help to explain the higher prevalence of psychiatric disorders in IMID

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Labouta, Hagar
Email:	Hagar.labouta@umanitoba.ca
Telephone:	204-474-8380
Title:	Bioinspired nanoparticles for breaching the biological barriers
Number of students I would accept to work on this project:	2

Short Description of Research (250 words maximum):

Nanotechnology, or more appropriately nanoscience, is a multidisciplinary branch of science that currently receives a lot of attention from researchers in the pharmaceutical and biomedical fields. Using nanoparticles in drug delivery and diagnostics offers several advantages over traditional formulations, such as modified pharmacokinetics and tissue distribution, site-specific targeting, reduced toxicity, prolonged release, improved stability and bioavailability. My research program aims at understanding the interaction of nanoparticles within the different biological compartments and translating this knowledge to design new generations of bio-inspired nanoparticles for breaching the biological barriers of the body. The student will be involved in a cutting edge research program to design various nanoparticles with different size, composition and surface properties. The student will then test these particles using in vitro cell models developed in the lab for therapeutic applications. The student will work in a collaborative environment among a team of researchers with different backgrounds who will guide him/her in his summer research project. The student will also attend lab meetings and will present his or her work to the team. Depending on the student's progress and contribution to the project, he or she can be a co-author on the outcome publication.

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Lakowski, Ted
Email:	Ted.Lakowski@umanitoba.ca
Telephone:	2042723173
Title:	Probing the catalytic mechanism of histone lysine methyltransferases.
Number of students I would accept to work on this project:	1-2

Short Description of Research (250 words maximum):

Gene expression is, in part, controlled by post-translational modifications (PTMs) to the DNA packaging proteins, histones. Such histone PTMs fall under the general field of epigenetics. It is the study of heritable changes in gene expression not derived from DNA sequence including, DNA methylation, and PTMs to chromatin. This research program focuses on post-translational modifications to histones, which recruit transcription factors, and remodel chromatin structure resulting in changes in transcription. The objective of this research is to use liquid chromatography mass spectrometry (LC-MS/MS) to probe the mechanisms of catalysis and substrate specificity of epigenetic enzymes.

The enzymatic mechanism and activity of histone lysine methyltransferases (HKMT), on modified and unmodified histones, will be measured using LC-MS/MS. Epigenetic bi-substrate enzymes require a histone residue substrate and a co-substrate. The order of binding of substrates and dissociation of products dictate the kinetic mechanism. Representative HKMT, enzymes and their histone substrates have been expressed and purified. The co-substrates will be purchased, enzymatic kinetic mechanism elucidated and the V_{max} and K_M for each substrate will be determined using mass spectrometry.

Some histone modifications increase while others decrease transcription depending on the context suggesting that prior histone modifications can affect the deposition of new modifications. However, it is not known if this happens at the enzymatic level or by another mechanism. To test this we will measure HKMT activity on pre-modified histones.

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Lucy Marzban
Email:	lucy.marzban@umanitoba.ca
Telephone:	204-789-3662
Title:	New strategies to preserve insulin producing beta cells in diabetic patients
Number of students I would accept to work on this project:	1-2

Short Description of Research (250 words maximum):

Diabetes is the most common endocrine disorder worldwide. Two major types of diabetes are Type 1 (T1D; Juvenile onset) and type 2 (T2D; adult onset) diabetes. In both types of diabetes pancreatic islet beta cells fail to produce enough insulin leading to elevated blood glucose but the underlying mechanisms are different. Beta cell dysfunction and impaired insulin action in the peripheral tissues are two key events in T2D. Patients with T2D need glucose lowering drugs and eventually insulin treatment. In T1D patients, beta cells are destroyed by the body's immune system leading to lifelong insulin therapy. Islet transplantation has provided a feasible approach for treatment of T1D but is currently limited by available donors and long-term survival of transplanted islets.

Formation of toxic protein aggregates, named islet amyloid, in patients with T2D and transplanted islets contributes to beta-cell death in both conditions. Studies in our group focus on exploring the mechanisms by which amyloid causes beta-cell death to develop new therapeutic strategies to protect islet beta cells from amyloid toxicity in T2D and prolong islet graft survival in T1D patients. Students who join our research group will learn how to culture islets, prepare tissue sections, immunolabel live and fixed cells/tissues, and use imaging techniques. Students will also develop problem-solving, data analysis, and presentation skills by participating in our regular lab meetings. Our lab is located in the Apotex Centre at Bannatyne Campus, a multi-disciplinary research environment that provides trainees various opportunities for interaction with scientists from other health research disciplines.

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Stobart, Jillian
Email:	Jillian.stobart@umanitoba.ca
Telephone:	202-272-3180
Title:	Brain pericyte calcium signaling and blood flow control
Number of students I would accept to work on this project:	2

Short Description of Research (250 words maximum):

Pericytes are cells found on brain capillaries. Exciting new evidence suggests that pericytes may regulate the blood-brain-barrier and dilate capillaries to increase blood flow where needed. Both of these roles are essential for brain health and pericytes may become dysfunctional or die during disease, such as stroke or Alzheimer's disease. Our research focuses on calcium signalling in pericytes, which is likely important for regulating blood flow. We want to know: what causes calcium signals in pericytes? What happens as a result of these signals? These questions are fundamental for understanding pericyte physiology and their role in the brain. This work may also lead to future development of pericyte-specific drugs for therapeutic use. Students who join our energetic team will have the opportunity to work directly with mice, including mouse handling, training, and injections. Students will also learn two-photon microscopy, the latest, state-of-the art microscopy technique in neuroscience. They will use this microscope to record movies of beautiful, never-before-seen calcium signals in pericytes in the brains of live mice in real-time. Students will also gain valuable computer skills by learning to analyze these calcium movies through programs such as MATLAB and R. Students will also develop communication and problem-solving skills by participating in regular lab meetings in a group setting. Our lab is located in the Apotex Centre at the Bannatyne Campus, a dynamic community that encourages interactions between scientists from various health research disciplines.

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Tranmer, Geoffrey
Email:	geoffrey.tranmer@umanitoba.ca
Telephone:	474-8358
Title:	Breaking Bad 2.0: The Anticancer Chronicles
Number of students I would accept to work on this project:	1 or 2

Short Description of Research (250 words maximum):

Unlike the Breaking Bad television series, an academic medicinal chemistry lab is well equipped to synthesize new drugs (anticancer) and we actually want to help people/patients. My group is in the process of preparing to file a patent for a series of anticancer compounds with the assistance of a patent agent and the University of Manitoba Technology Transfer Office. *I have been instructed not to disclose the general structure of the molecules to be patented*; however, I can provide a brief overview of the project below. The summer student will synthesize new anticancer drugs relating to this patent application and assist in the study of the anticancer properties of the compounds using various biochemical assays. This is a medicinal chemistry project where the student will synthesize new molecules on a daily basis, and assist in the testing of their anticancer properties with the help of a doctoral student. Additionally, the student may also perform some *in vitro* cell based assays, following proper training. Overall, the summer research project is like a G-Rated academic version of Breaking Bad, but much less glamorous, dramatic or cinematic, and a whole lot safer and intellectually rewarding. *Disclaimer: No recreational vehicles will be harmed during the completion of this project.*

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Turcotte, Dana
Email:	Dana.turcotte@umanitoba.ca
Telephone:	204-272-3170
Title:	Opioid Education and Tapering in Clinical Practice
Number of students I would accept to work on this project:	2

Short Description of Research (250 words maximum):

Objectives:

1. To offer educational sessions that will provide individuals living with chronic pain who are on long-term opioid therapy with knowledge and tools to understand and navigate the complex nature of pain and the pain experience, as well as better understand the role of opioids in pain management.
2. To evaluate the overall impact of a multidisciplinary opioid tapering program on opioid consumption and pain for patients on long term opioid therapy with chronic non cancer pain.
3. To assess the impact of pain education sessions on tapering outcomes in a multidisciplinary opioid tapering program.

The proposed study seeks to develop and test multidisciplinary opioid education and tapering interventions - with input from anesthesia, pharmacy, and psychology - designed to assist consenting individuals who desire to reduce or eliminate their use of prescribed opioid medications. The project will occur in two phases: Phase 1 (Patient Educational Workshops; PEW), a choice to participate in a 6-hour patient education workshop providing information on the nature of chronic pain, the risks of prolonged opioid use, effective alternatives to opioid therapy, and a brief acceptance and commitment therapy intervention targeting increased psychological flexibility and valued living; and Phase 2 (Multidisciplinary Tapering Program; MTP), an optional multidisciplinary tapering program involving a patient-centered care plan with meaningful tapering goals and consistent planned care visits.

University of Manitoba Undergraduate Research Award competition
College of Pharmacy Research Projects

Name (Last, First):	Eltonsy, Sherif
Email:	Sherif.eltonsy@umanitoba.ca
Telephone:	204-318-2576
Title:	Assistant Professor
Number of students I would accept to work on this project:	2

Short Description of Research (250 words maximum):

Epilepsy in pregnant women causes frequent seizures, increasing the risk of pregnancy-related complications. Antiepileptic drugs (AEDs) are prescribed to reduce the severity of epilepsy or help manage other conditions such as pain, psychiatric disorders, and migraine. Women taking AEDs – especially first-generation – have a greater risk of miscarriage and teratogenicity, because these agents can be transferred to the fetus via the placenta. The use of many first-generation AEDs (e.g. valproate) in pregnant women has been studied extensively. Several large-scale pregnancy registries were established to evaluate the safety of first- and newer-generation AEDs (e.g. topiramate and gabapentin). A major limitation of existing studies is the challenge in separating the effects of medications exposure from the effects of maternal illness itself. In Addition, few studies to date have investigated the impact of AEDs exposure on long-term neurodevelopmental disorders and these have found conflicting results. Importantly, little is known about the *comparative safety* of antiepileptic treatment regimens, and previous studies comparing multiple AEDs are often small and underpowered. This project aims to examine the comparative safety of antiepileptic treatment regimens during pregnancy on short and long-term outcomes in newborns and children in Canada. A series of investigative studies will be conducted, including scoping and systematic reviews and cohort studies using administrative health and social data housed at the Manitoba Centre for Health Policy (MCHP) and other Canadian provinces. This project aims to provide clinically relevant evidence that improves prescribing standards for pregnant women and facilitate evidence-based decision-making by health professionals and policy makers.