DIVISION OF NEURODEGENERATIVE DISORDERS

2021 ACTIVITY REPORT

LOCATION:
St. Boniface Hospital Albrechtsen Research Centre
351 Taché Avenue
Winnipeg, Manitoba R2H 2A6
Canada
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1. Message from the Director

The Division of Neurodegenerative Disorders (DND) is housed within the Dr. John Foerster Centre for Health Research on Aging, located in the St. Boniface Hospital Albrechtsen Research Centre. DND was established in 1999 through a major funding initiative “Age of Discovery” by the St. Boniface Hospital Foundation. I am pleased to provide you with a copy of the Division of Neurodegenerative Disorders’ 2021 Activity Report. I invite you to read about the exciting activities over the past year.

I am pleased to report that during 2021, the Division’s total active grant funding held by our researchers was just over $7 million. Dr. Miyoung Suh received new funding from CIHR (and NSERC and SSHRC) on her project ‘Implementing Smart Cities Interventions to Build Healthy Cities (SMART) Training Platform’. Dr. Suh also received an AKCSE Women in Science and Engineers (WiSE) Award from The Korean Federation of Science and Technology Societies presented in Halifax in the Fall of 2021.

Dr. Renée Douville joined DND in summer of 2021. Dr. Douville is a Professor of Biology, University of Winnipeg. Dr. Douville also holds an Adjunct Professor appointment with the University of Manitoba. She is studying motor neuron disease (ALS), Alzheimer’s disease and is interested in the possible pathogenic role of endogenous retroviruses. Congratulations to Dr. Ben Albensi who accepted a position as Chair of Pharmaceutical Sciences at Nova Southeastern University in Florida, USA. Recruitment is underway to bring in a new member of DND via the Department of Pharmacology & Therapeutics; this will be a tenure track post at assistant or associate professor level.

There were an outstanding number of publications during 2021. Our investigators published a total of 41 full length publications.

There were 5 invited speakers through the Manitoba Neuroscience Network Visiting Speaker Program as well as 7 local talks by our neuroscience group. Our Speaker Program is funded jointly by: Manitoba Neuroscience Network, the Division of Neurodegenerative Disorders at St. Boniface Research Centre, the Department of Pharmacology & Therapeutics, University of Manitoba and the Neuroscience Research Program at the Kleysen Institute for Advanced Medicine. We continue to coordinate and funnel all neuroscience related talks from these partners through the Manitoba Neuroscience Network and this has worked very well in preventing overlap of visits, talks, etc. The Division also participates in the Department of Pharmacology & Therapeutics Weekly Seminar Program. The Manitoba Neuroscience Network’s administrative office continues to operate out of the Division’s administration office.

DND investigators continue to provide a broad array of teaching to University of Manitoba undergraduate and graduate students. Our graduate students and trainees attracted a total of 37 awards throughout 2021. In spite of difficult funding times with cut backs at CIHR the DND group continues to prosper and with hopes of further expansion in the future.

Respectfully Submitted,

Paul Fernyhough, Ph.D.
Director, Division of Neurodegenerative Disorders at St. Boniface Hospital Albrechtsen Research Centre
Professor, Department of Pharmacology & Therapeutics, University of Manitoba
### 2. Our Staff (72)

**Principal Investigators (8)**
- Fernyhough, Paul (Director)
- Albensi, Benedict
- Aliani, Michel
- Douville, Renée
- Glazner, Gordon
- Modirrousta, Mandana
- Smith, Darrell
- Suh, Miyoung

**Graduate Students (12)**
- Amiri, Shayan
- Benoit, Ilena
- Chauhan, Sanjana
- Fahmi, Ronak
- Feltham, Bradley
- Kloss, Olena
- Mishra, Pranav
- Ramezani, Fatemah
- Semenko, Breanne
- Shulgina, Veronica
- Walchuk, Chelsey
- Yoon, Rex

**Undergraduate Students (18)**
- Albensi, Speranza
- Boticki, Luka
- Demare, Sarah
- Fedorova, Yulia
- Goubran, Doris
- Hoang, Amila
- Jiang, Annie
- Narvey, Samuel
- Oyeyode, Marvellous
- Pasanna, Pearl
- Phillips, Serena
- Rempel, Megan
- Sinclair, Felicia
- Sliker, Alana
- Vandenakker, Alex
- Verhaeghe, Lauren
- Wilson, Jeffrey

**Postdoctoral Fellows & Research Associates (9)**
- Adlimoghaddam, Aida
- Davies, Don
- Dordevic, Jelena
- Mirzaeian, Soheila
- Naznin, Farhana
- Ruchira, Nandasiri
- Safaei, Akram
- Snow, Wanda
- Waise, TM Zaved

**Technicians (16)**
- Butt, Amina Moazzam
- Di Curzio, Domenico
- Goldberg, Erin
- Le, Khuong
- Mangat, Sandeep
- McElrea, April
- Mostafizar, Marina
- Odero, Gary
- Olson, Nancy
- Nandha, Heenal
- Nguyen, Thi Anh Thu
- Oyekan, Ruth
- Perez, Claudia
- Tessler, Lori
- Thomas, Nikita
- Shariati-Ievari, Shiva

**Other (6)**
- Prasad, Ben (rTMS psychiatrist)
- Wikstrom, Sara (rTMS nurse)
- Dubiel, Paola (rTMS nurse)
- Meek, Benjamin (rTMS Coordinator)
- Mitalay, Caterina (rTMS Secretary)
- Smedvik, Jason (software architect)

**Administration (3)**
- Fernyhough, Paul (Director)
- Fowler, Debbie (Technician)
- Jorundson, Kelly (Admin. Manager)
3. Academic Research Projects

A. Dr. Benedict Albensi

My laboratory attempts to identify molecular signaling pathways and mechanisms that could be targeted with promising therapeutics for enhancing memory and for preventing and/or reversing memory impairments, in diseases or conditions such as Alzheimer’s disease, but also stroke, head trauma, infections, and epilepsy etc. Much of our work is centered on a biochemical pathway involving the transcription factor, nuclear factor kappa B (NF-kB), which is central to not only inflammatory processes and immune system function but also plays a central role in basic mechanisms of memory formation and recall.

To this end, the Albensi lab focuses on investigating approaches for preventing and treating Alzheimer’s disease (AD) and related dementias. For example, investigations into the prevention of AD have included choline, creatine, and flaxseed (omega-3). For later stage AD, compounds such as nilotinib and approaches such as mitochondrial transfusion are being investigated.

Project 1:
Women are at higher risk of acquiring Alzheimer’s disease (AD) and other dementias, and approximately 2/3 of seniors with AD in Canada are women (http://www.alzheimer.ca). In fact, for most regions of the world, the incidence of AD is higher in women than in men. Differences in lifestyle factors, brain development, hormonal programming, cellular and molecular mechanisms, genetic, and/or metabolic differences may be at the root cause, but no one knows for sure. While the primary risk factor for developing AD is age, the higher AD incidence rates in women cannot be attributed simply to the increased longevity of women versus men. Currently, there is no cure for AD, and treatments targeting amyloid beta (Aβ) and/or neurofibrillary tangles (NFTs) have been largely ineffective in both
genders. However, it is becoming apparent that changes in brain metabolism driven by mitochondrial dysfunction are processes central to many age-related neurodegenerative disorders. This project focuses on sex-specific mechanisms of mitochondrial dysfunction in early stage AD. We expect our findings to have specific relevance to women with AD and should help to prevent AD in women. Our findings may also be generalized to men, and other age-related neurodegenerative disorders and mitochondrial based disorders.

**Project 2:**

Developed nations around the world are facing a crisis as the annual number of new cases of Alzheimer’s disease (AD) is set to skyrocket over the next 15 years. Therefore, successful interventions to prevent and/or treat AD will be of great interest to the public, healthcare professionals, and government officials. Flaxseed containing beverage products may present a solution in preventing AD, with Manitoba playing a leading role in this pursuit. Manitoba currently produces 12% of the world’s flax; therefore, increased demand for flaxseed will result in more Manitoba flax produced and sold. The dietary benefits of flax can help drive this demand, especially its effect on memory and cognition (i.e. thinking, knowing, perception). The goals of this project are to determine: 1) the effect of flax beverage on memory and cognition (primary outcome) and 2) determine the economic impact of results from goal 1 on the MB agriculture industry and the health care sector. Goal 1 will be accomplished by conducting a clinical trial with flax milk. In goal 2, we will estimate the economic impact of flaxseed's beneficial effects on the demand for flax milk and flax. The work for this project will be completed by a multi-disciplinary team made up of medical professionals, basic scientists, a statistical consultant, and a health economist.

**Project 3:**

The objective is to evaluate the effects of the anti-cancer drug, nilotinib for treating Alzheimer’s disease (AD). In particular, we will focus our efforts on evaluating brain metabolism and the pathologic consequences of using nilotinib in relevant mouse models of AD and aging. Nilotinib, a tyrosine kinase activity inhibitor, is traditionally used for treating chronic myelogenous leukemia (CML). The rationale for using nilotinib in AD is based on our recent preliminary data and results from our colleagues at Georgetown University. Previously our collaborator, R. Scott Turner and his associates used this compound in Parkinson’s disease (PD) and Lewy Body dementia (LBD) patients (advanced stage), and surprisingly showed in
the data collected thus far (n=11 patients completed), that low-dose nilotinib (150-300 mg) for 6 months promoted the clearance of accumulated amyloid beta (Ab) plaques and hyperphosphorylated Tau - tangles. Their studies focused on safety, CSF biomarkers of PD, dopamine levels, blood-brain barrier (BBB) effects, cognitive, and motor changes in patients with PD and LBD - and more recently in patients with AD (recruitment underway). Given the interesting PD/LBD results we hypothesize that nilotinib may clear AD pathological markers by modulating mitochondrial function – in particular by initiating mitophagy, a cellular clean-up mechanism associated with mitochondrial quality control. The project detailed here will be the first to examine the mechanistic effects of nilotinib on brain metabolism and mitochondrial function in relevant transgenic mouse models of AD and aging.

Project 4:

A large number of studies have shown that nuclear factor kappa B (NFkB) is a network hub responsible for complex biological signaling, including transcriptional regulation in the cytoplasm and nucleus. Given that NFkB is an ancient protein transcription factor, it has been hypothesized to be a master regulator of evolutionarily conserved biochemical signaling cascades. Our prior studies, including NSERC funded work, and preliminary data show roles for NFkB in synaptic plasticity, memory, and mitochondrial function. In 2001, it was first published that NFkB subunits were found in the mitochondria, including not only IkBalpha and NFkB p65 subunits, but also NFkB signaling pathway proteins such as IKKalpha, IKKbeta, and IKKgamma. My laboratory has also recently found evidence for NFkB localization and activity in the mitochondrion. Mitochondria are the primary source for biological energy generation in the cell, which manifests itself in the form of the coenzyme adenosine triphosphate (ATP). Mitochondria are also ancient in their appearance in the biological record and have been hypothesized to have originated from bacterium having their own DNA. To date, little work has been done to understand the significance of NFkB subunits and related NFkB signaling pathway proteins in the mitochondria and how this may affect normal mitochondrial functions. Also, little is known on how NFkB regulates mitochondrial function in a context of energy demand at plasticity active synapses. A small number of studies provide preliminary evidence for NFkB in controlling mitochondrial function however a precise understanding of how NFkB contributes to various mitochondrial functions is lacking. Our long-term goal is to find novel roles for NFkB in synaptic plasticity, memory, and mitochondrial function. The purpose of this research is to understand how NFkB activity contributes to cellular respiration, mitochondrial Complex (IV) expression and function, and mitochondrial dynamics & motility. Given our current pilot data and the existing literature, we expect to find important roles for NFkB in the regulation of mitochondrial function, which have not been characterized nor fully understood. The impact of this work is significant for training HQP on cutting edge projects and hugely important for understanding the regulation of normal mitochondrial function, and the contribution of mitochondrial function to processes such as synaptic plasticity and memory.
B. Dr. Michel Aliani

A functional food is any food claimed to have a health-promoting or disease-preventing property beyond the basic function of supplying nutrients. Nutritional interventions using functional foods have had a considerable role as legitimate therapeutic strategies to combat common metabolic disorders in Canada and around the world.

Acceptability of functional foods is a constantly evolving challenge to nutritional interventions where compliance is a key factor for success. Incorporation of novel ingredients in functional foods may shift the molecular balance of flavour precursors which can compromise consumer acceptability. Therefore, understanding the molecular interactions among natural flavor precursors and added bioactive compounds is crucial to our understanding of flavour formation in functional foods. Once ingested, the bioactive compounds are susceptible to major changes in the body with formation of novel compounds engaged in different biochemical pathways. The metabolomics studies of the metabolites derived from functional foods in the body are extremely informative on the effects exerted by these compounds.

The focus of Dr. Aliani’s research is therefore two-fold.

- To provide the scientific and molecular basis for the development and successful marketing of functional foods targeted to patients as well as healthy populations in the world and
- To investigate the effect of active compounds on metabolic pathways in animal and human model.

Technician Shiva Shariati (Supervisor: Dr. M. Aliani)
Dr. Aliani’s current research projects include:

- Creation of a database for selected pulses and to investigate the effect of different processing on bioactive compounds using mass-spectrometry and NMR techniques (Funded by Saskatchewan Pulse Growers/CIGI/Warburton Ltd; Ronak Fahmi PhD project). This project is still ongoing and Ronak Fahmi is now writing her PhD Thesis.
- Genetic markers for flavour selection in pork (Funded by ARDI in collaboration with Maple Leaf Ltd.; Erin Goldberg Post-doctoral Funded by MITACS). This project has been completed and a report has been provided Maple Leaf Ltd.
- Identification of cancer specific metabolic signatures in body fluids of the patients with early stage lung cancer using proton magnetic resonance spectroscopy (MRS) and mass spectrometry (MS) (Collaboration with Dr. Naseer Ahmed Funded by Manitoba Cancer Care). This project has been completed and two abstracts have been submitted. Manuscripts are currently being prepared.

*Research Associate Domenico Di Curzio (Supervisor: Dr. Renée Douville)*
C. Dr. Renée Douville

Endogenous retroviruses (ERVs) are genomic fossils from retroviral infections of our human ancestors and comprise over 8% of our DNA. We share a long-standing symbiosis with these viruses that inhabit our genome. Current research indicates that not all ERVs remain silent passengers within our DNA, as their reactivation is associated with several cancers, inflammatory diseases and neurological disorders. It is crucial to consider ERV expression as a potential driving force in disease pathology.

We propose a unique perspective regarding the origin of viral pathology in ALS – it stems from select viruses within our DNA. Human endogenous retrovirus-K (ERVK / HERV-K) is a genomic viral symbiont that contributes towards ALS neuropathology. We are exploring how ERVK drives motor neuron disease and inflammation through the following projects in our laboratory:

1) The Douville lab has recently discovered a new ERVK protein called conotoxin-like protein (CTXLP). We are investigating how this novel viral protein contributes to ALS neuropathology by modulating inflammatory signaling and calcium channels in neurons.

2) We have predicted and shown that the ERVK integrase enzyme (a key viral protein for virus replication) causes DNA damage. This viral protein further modulates the DNA damage response and innate immune signaling cascades. We are investigating if integrase inhibitors could be used to treat ERVK integrase mediated motor disturbances in a fruit fly model with ERVK integrase-driven motor deficits.

3) We are screening new drugs to inhibit the ERVK protease enzyme. The ERVK protease is required for viral replication and to produce mature viral proteins. Thus, blocking its activity is an important therapeutic strategy to fight ERVK.
D. Dr. Paul Fernyhough

The WHO informs us that by 2025 there will be 300 million sufferers from diabetes worldwide – a figure approximately equal to the population of the USA. Neurobiologist Dr. Fernyhough is studying the etiology of the peripheral nerve damage observed in patients with diabetes. In addition, he is researching the link between Alzheimer’s disease and Type 2 diabetes. “In patients with Alzheimer’s disease there is an increased risk of developing diabetes and these patients exhibit more severe and accelerated memory loss” says Dr. Fernyhough.

Our studies are focused on identifying key signaling pathways that are impaired in animal models of Alzheimer’s disease. A major direction of the lab is to determine whether improper insulin signal transduction in neurons is central to axon and neuronal loss.
Dr. Fernyhough’s laboratory will be taking 2 paths over the next 3-5 years:

**PROGRAM 1** – The main focus of our research will take a hypothesis-driven approach and perform mechanistic studies in order to understand the etiology of diabetic sensory neuropathy. This work is currently supported by CIHR and NIH. The program is multidisciplinary involving *in vitro* and *in vivo* paradigms and includes collaborative arrangements (see section later describing collaborations). The main body of work will use cutting edge real time imaging with standard and confocal microscopes to assess the role of impaired Ca²⁺ homeostasis, mitochondrial dysfunction, AMP-activated protein kinase pathway analysis and enhanced ROS levels in the etiology of diabetic neuropathy. Studies will be performed on adult neuronal tissues as single neuron cultures or slices of neuronal tissue.

**PROGRAM 2** – In parallel the laboratory will take a translational approach and attempt to identify novel drugs for treatment of diabetic neuropathy. The JDRF has supported my laboratory in order to extend our drug screen studies. This work has now been supported by CIHR and NIH. We have identified at least 4 FDA-approved compounds that can improve axon regeneration in cultures of adult sensory neurons. This work has been taken *in vivo* to test the drugs in whole animal models of type 1 diabetes. In addition, medicinal chemistry is being used to identify related compounds that may also be efficacious and will permit generation of new IP. A CIHR-SPOR network grant is now supporting human clinical trials in diabetic neuropathy with a topical formulation developed in collaboration with Dr. Nigel Calcutt at UCSD. This work is being performed by Drs. Vera Bril and Bruce Perkins at the University Health Network in Toronto. This work is being mediated by a small biotech company, WinSanTor Inc, where Drs. Fernyhough, Nigel Calcutt and Lakshmi Kotra are the co-founders and Stanley Kim is the CEO. The company has been funded by several NIH SBIR and STTR grants to support drug development for treatment in diabetic neuropathy, chemotherapy-induced peripheral neuropathy and HIV-induced neuropathy. Both programs of work are comprised of a number of local, national and international collaborations.
E. Dr. Gordon Glazner

Cellular biologist Dr. Gordon Glazner is investigating protective mechanisms within the cell. When a neuron is under stress, it fights for survival by increasing the production of certain proteins. The balance that is struck between the death-inducing stress and the production of protective proteins will determine whether the cell lives or dies. The production of these proteins is controlled by transcription factors, and one of the most important of these is NF-kappaB. “NF-kappaB is a stressed-induced anti-stress response,” Dr. Glazner explains. “In neurons, NF-kappaB is always fairly high, which isn’t true of other cells. We believe it is important not just for survival but for function of the neuron itself, so discovering the ways in which outside messengers impact on that can be important for our understanding of how the nerve itself works and, in turn, for our understanding of clinical pathologies which involve neuronal death.”
F. Dr. Mandana Modirrousta

Research in the Neuromodulation and Neuropsychiatry Unit focuses on improving and expanding the application of neuromodulation as an investigational as well as a treatment tool. Successful, goal directed behaviours require optimal and effective communication between several brain regions. Disruption of brain network, either as a result of a structural abnormality (e.g. brain injury) or dysfunction can result in different neuropsychiatric disorders. Our research in “Neuromodulation and Neuropsychiatry Unit” attempts to understand how to optimally use brain stimulation techniques to treat neuropsychiatric disorders.

Dr. Modirrousta is also the Director of the Neuromodulation & Neuropsychiatry Unit at the St. Boniface Hospital since 2013. She holds academic positions with the University of Manitoba as an Associate Professor in Department of Psychiatry and an Adjunct Professor in the Department of Physiology & Pathophysiology.

Current Projects

- We have a number of manuscripts at various stages of preparation and peer review with regards to the use of repetitive transcranial magnetic stimulation (rTMS) to improve symptoms associated with Traumatic Brain Injury, Obsessive Compulsive Disorder, and Mild Cognitive Impairment.
- Publishing the results of a collaboration with Dr. Amir Ravandi in which we compared oxylipidomic profiles of responders and non-responders to rTMS treatment for depression.
- Testing the efficacy of rTMS for symptoms associated with Primary Progressive Aphasia.
- Ongoing multi-site clinical trial comparing the efficacy of rTMS and pharmaceuticals for patients with treatment-resistant depression.
- Retrospective chart review regarding the prevalence of Functional Cognitive Disorder (FCD) within the Neuromodulation and Neuropsychiatry Unit.
- Retrospective chart review of factors associated with positive outcomes for patients with depression treated with rTMS at St. Boniface Hospital.
- Systematic literature review of FCD.
- Online survey of patients and health care providers to assess the impact on health delivery in Manitoba of the shift to virtual health care delivery during the COVID-19 pandemic.
- Assessing the use and impact of social media and communication technology in the elderly during the COVID-19 pandemic.
- Assessing whether the use of Virtual Reality as a model for feel-real socialization can improve both the mental and the physical health of elderly people during the pandemic.
- Analyzing the impact of social distancing measures on health outcomes and mortality in elderly individuals using machine learning techniques.

Research Associate Dr. Aida Adlimoghaddam (Supervisor Dr. Ben Albensi) with Graduate Student Sanjana Chauhan (Supervisor: Dr. Paul Fernyhough)
G. Dr. Miyoung Suh

Nutrition and Degenerative Eye Diseases: Nutrients can prevent and/or improve retinal diseases such as diabetic retinopathy, macular dystrophy, and computer vision syndrome. More recently, Dr. Suh’s research has looked into translational studies using humans, which are based off her previous research in various animal models (e.g. Fat-1 mice, type-1 diabetic retinopathy rat model, elongation of very long chain fatty acid 4 (elovl4) deficient mice, and neonatal piglets). Through the usage of nutrient intervention with DHA, β-carotene enriched formulation, lutein and DHA enriched eggs, and choline (deficient/sufficient formulation), she studies various dietary aids to help prevent/mitigate eye degeneration.

Nutrition and Male Reproductive Dysfunction: Lipids may play a critical role in male reproductive systems (spermatogenesis) in obese, diabetic, and alcohol-challenged animal models. Dr. Suh’s lab has found that docosapentaenoic acid (C22:5n-6) deficiency in testis phospholipids is closely related with abnormal testis growth and sperm production in rodent models. Male reproductive health has been decreasing in recent decades. By using various nutrition interventions (n-6 and n-3 fatty acids, zinc, and conjugated linoleic acid) and alcohol, her lab tries to find ways to maintain optimal male reproductive function.
Nutrition and Fetal Alcohol Spectrum Disorder: In very recent years, Dr. Suh’s research has explored the impact of nutrition on the fetal brain, retina, and reproductive organ development, by assessing their effects after the developing fetus is exposed to alcohol during pregnancy. This study involves both human and animal work, which will ultimately lead to the development of nutritional strategies for preventing or mitigating the severity of fetal alcohol spectrum disorder.
H. Dr. Darrell Smith

The goal of the lab is to advance the development and screening of agents that could be used to treat neurodegenerative problems, particularly peripheral neuropathies.

There is currently an incomplete understanding of the pathogenesis of most neurodegenerative disorders and there are no treatments able to delay the onset and slow the progression of many of these disorders. The common treatments used for peripheral neuropathies include pain relievers, anti-seizure medications, and antidepressants. These drugs are used to control the discomfort associated with peripheral neuropathies and have no effect on the progression of the neuropathies themselves.

Dr. Smith’s lab uses primary cell cultures of adult sensory neurons. These cultures are useful for studying the regulation of neuronal survival, axonal regeneration, and cellular bioenergetics of axotomized neurons in the adult setting. An advantage of using cultured neurons from adult animals is that animals with an established disease can be used as a source of culture material. This culturing system is excellent for examining the effectiveness of compounds in repairing and preventing neuropathies in vitro. Screening of compounds is also performed in vivo. Rodent models of Type I and Type II diabetes exhibit very consistent levels of peripheral neuropathy. These models are excellent for examining the ability of compounds to prevent and/or reverse diabetic peripheral neuropathy in vivo.

*Photos taken by Research Associate Dr. T.M. (Zaved) Waise (Supervisor Dr. Paul Fernyhough)*

*while observing the morphology of adult sensory neurons.*
4. Academic Funding

Total Academic Active Funding in DND: $7,027,239

Our faculty hold major funding awards from national/international agencies such as the Canadian Institutes of Health, Natural Sciences and Engineering Research Council of Canada, Research Manitoba, Canadian Agricultural Partnership, Mitacs, ALS USA, and the Alzheimer Society. Our research is also supported by the St. Boniface Foundation and various provincial agencies such as Manitoba Egg Farmers, Manitoba Liquor & Lotteries, ALS Association, the University of Manitoba and Cancer Care Manitoba.
The following is a breakdown of active funding held by each of our principal investigators in 2021.

### A. Dr. Benedict Albensi

<table>
<thead>
<tr>
<th>DATE</th>
<th>AGENCY</th>
<th>TITLE</th>
<th>TOTAL AWARD</th>
<th>AMOUNT /YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/2019 - 3/2022</td>
<td>Canadian Agriculture Partnership</td>
<td>Role: PI Title: Effects of dietary flaxseed on memory and cognition.</td>
<td>430,746</td>
<td>143,582</td>
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<tr>
<td>04/2019 - 03/2024</td>
<td>CIHR</td>
<td>Role: PI Title: Sex-based differences associated with mitochondrial dysfunction in Alzheimer’s disease.</td>
<td>725,985</td>
<td>145,197</td>
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<td>2021</td>
<td>Mitrix Bio Inc USA</td>
<td>Mitochondrial contract (6 mon)</td>
<td>38,311</td>
<td>38,311</td>
</tr>
<tr>
<td>04/2021 – 03/2022</td>
<td>St. Boniface Foundation</td>
<td>Role: PI Title: Douglas &amp; Patricia Everett Endowment Alzheimer’s Res</td>
<td>79,875</td>
<td>79,875</td>
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</table>

**Total Funding – Albensi**  1,274,917  406,965

### B. Dr. Michel Aliani

<table>
<thead>
<tr>
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<th>AGENCY</th>
<th>TITLE</th>
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</thead>
<tbody>
<tr>
<td>2021</td>
<td>Canadian Malting Barley Technical Centre (CMBTC)</td>
<td>Contract</td>
<td>Role: PI Aliani Title: Effect of barley varieties &amp; brewing locations on beer flavor.</td>
<td>26,634</td>
</tr>
<tr>
<td>2019/04-2024/03</td>
<td>National Sciences and Engineering Research Council of Canada (NSERC)</td>
<td>Discovery Individual</td>
<td>Role: PI Title: Understanding complex interactions between flavor precursors in meat-pulse products using a flavouromics platform</td>
<td>200,000</td>
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<tr>
<td>04/2021-04-2023</td>
<td>National Research Council (NRC)</td>
<td>Role: PI Title: Flavouromics for pulses studies.</td>
<td>249,975</td>
<td>124,988</td>
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<tr>
<td>2021-2022</td>
<td>Government of Manitoba/ Manitoba Agriculture</td>
<td>Role: PI Title: Capacity increase in off-flavour research</td>
<td>44,592</td>
<td>44,592</td>
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<tr>
<td>2019/04-2020/03</td>
<td>NSERC</td>
<td>Role: PI RTI Award Title: GC-MS for flavouromics platform</td>
<td>150,000</td>
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**Total Funding - Aliani**  671,201  371,214
C. Dr. Renée Douville

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<th>TITLE</th>
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<th>AMOUNT /YEAR</th>
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<tbody>
<tr>
<td>2016 – 2023</td>
<td>NSERC</td>
<td>Discovery Individual</td>
<td>Role: PI Discovery grant: RETROEXPLORER: An Interactive Database of Endogenous Retroviruses in the Human *COVID-19 one-year extension until 2023</td>
<td>176,000</td>
</tr>
<tr>
<td>2018 – 2022</td>
<td>ALS Association (USA)</td>
<td>Role: PI Integrase inhibitors as a therapeutic modality for ALS ($300,000 USD) Co-investigators: Dr. Alberto Civetta (University of Winnipeg), Dr. Kerri Schellenberg (University of Saskatchewan), Dr. Veronique Belzil (Mayo Clinic Florida) Effective: 09/2018, Ending: 02/2022 *No cost extension until July 2022</td>
<td>300,000</td>
<td>100,000</td>
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</table>

**Total Funding - Douville** 476,000 135,200
Research Assistants L-R Samuel Narvey & Megan Rempel (Supervisor: Dr. Renée Douville)

L-R Graduate student Ilena Benoit & her supervisor Dr. Renée Douville
### D. Dr. Paul Fernyhough

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>2019-2022</td>
<td>MITACs</td>
<td>Accelerate program</td>
<td>Role: PI; co-sponsor WinSanTor Inc. Training grant: Development of specific peptide antagonists of muscarinic receptors to repair the nervous system.</td>
<td>180,000</td>
</tr>
<tr>
<td>2019-2024</td>
<td>CIHR</td>
<td>Project</td>
<td>Role: PI: Fernyhough, P.; Co-PIs: DeKoninck, Y., UofLaval &amp; Calcutt, N.A., UCSD (with $100k matching from WinSanTor) Title: Muscarinic receptor antagonism as a novel mechanism for sensory nerve repair.</td>
<td>1,090,125</td>
</tr>
<tr>
<td>2019-2021</td>
<td>NSERC</td>
<td>Discovery Individual</td>
<td>Role: PI Discovery grant: Muscarinic receptor signaling pathways regulating axonal regeneration and sprouting in adult neurons.</td>
<td>64,000</td>
</tr>
<tr>
<td>2018-2023</td>
<td>St Boniface Foundation</td>
<td>Bank of Montreal Award</td>
<td>Role: PI Title: Energy failure in nerve fibers: its detection and therapeutic reversal in neurological disease.</td>
<td>250,000</td>
</tr>
<tr>
<td>2016-2021</td>
<td>CIHR</td>
<td>SPOR</td>
<td>Role: co-PI; PI: Lewis, G.F. (UofToronto); co-PI (part of team of 15) $25 million. Title: SPOR chronic disease network. SPOR network in diabetes and its related complications.</td>
<td>885,000</td>
</tr>
</tbody>
</table>

**Total Funding - Fernyhough**  
2,469,125  822,525

*L-R: Technicians Lori Tessler and Terra Nguyen (Supervisor: Dr. Paul Fernyhough)*
### D. Dr. Gordon Glazner

<table>
<thead>
<tr>
<th>DATE</th>
<th>AGENCY</th>
<th>TITLE</th>
<th>TOTAL AWARD</th>
<th>AMOUNT /YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>St. Boniface Foundation</td>
<td>Alzheimer’s research. Role: PI</td>
<td>100,000</td>
<td>100,000</td>
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</tbody>
</table>

**Total Funding - Glazner**  
100,000 100,000

### E. Dr. Mandana Modirrousta

<table>
<thead>
<tr>
<th>DATE</th>
<th>AGENCY</th>
<th>TITLE</th>
<th>TOTAL AWARD</th>
<th>AMOUNT /YEAR</th>
</tr>
</thead>
</table>
| 2017 - 2021   | Massachusetts General Hospital | Contract: Role: PI  
Title: Switching versus augmentation in treatment resistant depression (Research Contract) | 761,280 USD | 175,250 USD |
| 2020 - 2021   | University of Manitoba     | Small Research Equipment Grant  
Role: PI  
Title: Electroencephalography to measure brain activity before and after transcranial magnetic stimulation. | 24,300      | 24,300       |

**Total Funding - Modirrousta**  
785,580 199,550

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*L-R: Technician Amina Butt & Postdoctoral Fellow Soheila Mirzaeian (Supervisor: Dr. Miyoung Suh)*
### Dr. Miyoung Suh

<table>
<thead>
<tr>
<th>DATE</th>
<th>AGENCY</th>
<th>TITLE</th>
<th>TOTAL AWARD</th>
<th>AMOUNT /YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019-21</td>
<td>Egg Farmers of Canada</td>
<td>Role: PI Title: Egg as a strategy to maintain retina health in diabetes</td>
<td>128,146</td>
<td>64,073</td>
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<tr>
<td>2020-21</td>
<td>University of Manitoba</td>
<td>UofM Research Grant: UM53232</td>
<td>Role: PI Title: The effects of maternal DHA consumption on fetal hippocampal development in rats exposed to chronic ethanol during gestation</td>
<td>10,000</td>
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<tr>
<td>2020-2021</td>
<td>MB Agriculture</td>
<td>Ag Action Manitoba Program Research and Innovation Activity. Ag Action</td>
<td>33,360</td>
<td>33,360</td>
</tr>
<tr>
<td>2020-23</td>
<td>Manitoba Lotteries</td>
<td>Global leadership in reducing the impacts of FASD: Project 3 - Omega-3 docosahexaenoic acid as a nutrition strategy to protect brain against prenatal alcohol exposure and Fetal Alcohol Spectrum Disorder outcomes</td>
<td>225,000</td>
<td>75,000</td>
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<tr>
<td>07/2021</td>
<td>CIHR HTP-177412</td>
<td>Implementing Smart Cities Interventions to Build Healthy Cities (SMART) Training Platform.</td>
<td>854,000</td>
<td>142,334</td>
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<tr>
<td>Total Funding - Suh</td>
<td></td>
<td></td>
<td><strong>1,250,506</strong></td>
<td><strong>324,767</strong></td>
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<tr>
<td>DND Total Active Academic Funding Held in 2021</td>
<td></td>
<td></td>
<td><strong>$7,027,329</strong></td>
<td><strong>$2,360,221</strong></td>
</tr>
</tbody>
</table>

**Did you know......**

For the 10th year in a row, the St. Boniface Hospital is among Canada’s leading research hospitals, taking the #1 spot in western Canada and ranking in the Top 5 nationally, according to data released today by Research Infosource Inc. Canada’s source of R&D intelligence.
Active Team Grants (no funding received by our principal investigators, but listed as co-PI on award)

Dr. Benedict Albensi

<table>
<thead>
<tr>
<th>DATE</th>
<th>AGENCY</th>
<th>TITLE</th>
<th>TOTAL AWARD</th>
<th>AMOUNT /YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/2019 - 03/2024</td>
<td>Canadian Dementia Strategy-Team Grant</td>
<td>Role: co-PI Phase II. $46 million dollars to be distributed competitively among Canadian Consortium on Neurodegeneration in Aging (CCNA) members. (no funding received by Albensi so far)</td>
<td>6,063,172</td>
<td>1,212,634</td>
</tr>
</tbody>
</table>

Dr. Paul Fernyhough

| 2015 - 2020 | Research Manitoba | Cluster-Team Grant. DEVOTION: Developmental Origins of Chronic Diseases in Children Network. Role: co-PI (part of team of 12) PIs: McGavock, J. & Halayko, A. | 2,500,000   | 500,000      |
| 2015 - 2020 | Lawson Foundation | Cluster-Team Grant. DEVOTION: Developmental Origins of Chronic Diseases in Children Network Role: co-PI; PIs: McGavock, J. & Halayko, A. (part of team of 12; *matching for Research Manitoba) | 1,200,000   | 240,000      |

Active Operating grants where our principal investigators are a co-investigator

Dr. Michel Aliani

| 2019-2026 | CIHR | Project | Role: co-investigator Title: Investigation of the cytochrome P450 isoymes responsible for biotransformation of secoisolariciresinol diglucoside (SDG) derived enteroliganans and their interaction with metoprolol in hepatocytes and healthy adults. | 835,000 | 167,000 |
| 2021-2023 | CIHR | Traditional Indigenous Land-Based Diet and Chronic Inflammation: Does Adherence to the Traditional First Nations Diet Decrease the Severity of Chronic Inflammatory Diseases? | 573,751 | 286,875 |
**Commercialization Funding**

In addition to funding above, Dr. Fernyhough reported new commercialization funding for WinSanTor Inc.

1) In Fall 2018 WinSantor obtained **US$2 million** via STTR phase 2  
   (follow up from previously held grant)  
   Title: Development of pirenzepine for CIPN  
   NIH Grant Number: 2 R42 CA213555-02   PI: Andrew Mizisin, WinSanTor Inc

2) NIH award - SBIR program - NIDDK - 2R44DK104512-05  
   Regeneration of Epidermal Nerves in Human Diabetic Neuropathy.  
   PI: Kim, S. CEO of WinSanTor Inc.  
   Budget Period: 05/01/2019 – 04/30/2020;  
   Project Period: 09/30/2014 – 04/30/2022  
   SUMMARY TOTALS FOR YEARS 5-7: Yr 5 US$1,000,000; Yr 6 US$995,582; Yr 7 US$985,495

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Left: Fluorescence image showing M1R and pERK expression in HEK293 cell.

Below: M1R expression (red) on the surface of cultured rat DRG neuron

*(Photo by Research Associate TM Zaved Waise) (Supervisor Dr. Paul Fernyhough)*
Graduate Student Bradley Feltham
(Supervisor Dr. Miyoung Suh)

Postdoctoral Fellow Farhana Naznin
(Supervisor: Dr. Paul Fernyhough)
5. Trainee Funding/Awards

Congratulations to our trainees on receiving the following awards that supported their salary and/or travel to international conference to present their scholarly work they are conducting at St. Boniface Research Centre.

<table>
<thead>
<tr>
<th>NAME OF TRAINEE</th>
<th>SUPERVISOR</th>
<th>TYPE OF AWARD</th>
</tr>
</thead>
</table>
| Amiri, Shayan   | Dr. Paul Fernyhough | University of Manitoba Department of Pharmacology & Therapeutics - Deepak and Ratna Bose Prize  
University of Manitoba Graduate Enhancement of Tri-agency (GETS) |
| Fahmi, Ronak    | Dr. Michel Aliani | University of Manitoba Faculty of Graduate Studies Fellowship (UMGF) |
| Feltham, Bradley| Dr. Miyoung Suh | University of Manitoba Emerging Leaders Award  
University of Manitoba Faculty of Graduate Studies Research Completion Scholarship  
Garson N. (Gerry) Vogel Memorial Award  
Prairie Indigenous Knowledge Exchange Network PIKE-Net Graduate Fellowship;  
Doctoral Award for Indigenous Students  
University of Manitoba Doctoral Award for Indigenous Students  
Research Manitoba-Children’s Hospital Research Institute of Manitoba PhD in Health Research Studentship Award (declined)  
University of Manitoba Faculty of Graduate Studies Fellowship (UMGF);  
Honorable Mention poster competition 17th Annual Child Health Research Days. Winnipeg, MB. |
| Goubran, Doris  | Dr. Paul Fernyhough | NSERC Undergraduate Award (University of Manitoba)  
1st Place - Health Sciences, Undergraduate Research Poster Competition, University of Manitoba |
<table>
<thead>
<tr>
<th>Name</th>
<th>Advisor</th>
<th>Award Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jiang, Annie</td>
<td>Dr. Paul Fernyhough</td>
<td>University of Manitoba Research Award</td>
</tr>
</tbody>
</table>
| Mishra, Pranav     | Drs. Ben Albensi / Paul Fernyhough | Graduate Enhancement of Tri-agency (GETS)  
Dr. Mark Nickerson Grad Entrance Scholarship in Pharmacology and Therapeutics  
McCrerie-West Family Fellowship for Alzheimer Research  
Manitoba Neuroscience Network (MNN) photo contest – Brain Awareness week. 1st place |
| Narvey, Samuel     | Dr. Renée Douville     | NSERC Undergraduate Research Award (University of Manitoba)                                                                                                                                              |
| Naznin, Farhana    | Dr. Paul Fernyhough    | Mitacs Accelerate Postdoctoral Fellowship                                                                                                                                                                |
| Oyeyode, Marvellous| Dr. Paul Fernyhough    | Deacon Scholarship – St. Boniface Hospital Foundation                                                                                                                                                    |
| Phillips, Serena   | Dr. Paul Fernyhough    | Deacon Scholarship – St. Boniface Hospital Foundation                                                                                                                                                    |
| Semenko, Breanne   | Dr. Miyoung Suh        | Orval G. Caldwell and H. Ruth Gardner Caldwell Fellowship in Sustainable Agriculture/ Agroecology – FAFS  
Mark G. and Patricia N. Smerchanski Endowed Studentship Grant – St. Boniface Hospital Foundation  
TD Bank Group Graduate Student Award -St. Boniface Research Centre  
Margaret I. Morton Scholarships In Human Nutritional Sciences -FAFS |
| Sinclair, Felicia   | Dr. Renée Douville     | NSERC Undergraduate Research Award (University of Winnipeg);  
ISSP Program                                                                                                                                                                                               |
<p>| Verhaeghe, Lauren  | Dr. Paul Fernyhough    | BioTalent Canada Award (co-op University of Manitoba)                                                                                                                                                     |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Mentor</th>
<th>Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walchuk, Chelsey</td>
<td>Dr. Miyoung Suh</td>
<td>University of Manitoba Faculty of Graduate Studies Fellowship (UMGF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Recipient of (Graduate Student) Teaching Award 3 times</strong> North American Colleges and Teachers of Agriculture (NACTA)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Research Completion Scholarship, FGS</td>
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<td></td>
<td>Garson N Vogel Memorial Award, FAFS; Holmfridur Kristjansson Graduate Award in Nutrition, FAFS</td>
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<tr>
<td></td>
<td></td>
<td>Katharine MS Middleton Scholarship, FAFS</td>
</tr>
<tr>
<td>Wilson, Jeffrey</td>
<td>Dr. Paul Fernyhough</td>
<td>BioTalent Canada Studentship (co-op University of Winnipeg)</td>
</tr>
</tbody>
</table>

*Picture of the I.H. Asper Institute (left) and the Albrechtsen Research Centre (right) located at the St. Boniface Hospital Campus*
6. Teaching Activities

A. Benedict Albensi

University of Manitoba, Department of Pharmacology & Therapeutics

- Lecturer, Dept. of Pharmacology & Therapeutics, Univ. of Manitoba, DDSS 3162, Pharmacokinetics/Drug disposition. Two lectures.
- Lecturer, Dept. of Pharmacology & Therapeutics, Univ. of Manitoba, DDSS 3162 (formerly ORLB 3320), Epilepsy Drugs. One lecture on epilepsy drugs.
- Lecturer, Dept. of Pharmacology & Therapeutics, Univ. of Manitoba, Respiratory Pharmacology, RESP 1440 – 3 cr. hrs. Two to three lectures on pharmacokinetics.
- Lecturer, Dept. of Pharmacology & Therapeutics, Univ. of Manitoba, Pharmacy/Nursing/PA, PHAC 2100 – 6 cr. hrs. Two lectures on epilepsy/antiepileptic drugs.
- Lecturer, Dept. of Pharmacology & Therapeutics, Univ. of Manitoba, Pharmacy/PA, PHAC 2100 – 6 cr. hrs. Five-six lectures and tutorials on pharmacodynamics/pharmacokinetics/drug disposition.
- University of Manitoba Faculty of Health Sci., Physician Assistant students. PHAC 7230, Pharmacokinetics.
- Lecturer, Dept. of Pharmacology & Therapeutics, Univ. of Manitoba, Pharmacology, PHAC 7132/7134/7136 – 3 cr. hrs. Four-Six lectures and one tutorial on pharmacodynamics/pharmacokinetics/drug disposition (graduate students).
- Lecturer, Dept. of Pharmacology & Therapeutics, Univ. of Manitoba, Drugs in Human Disease, PHAC 4030 – 3 cr. hrs. Lectures on pharmacokinetics/drug metabolism and CNS drugs for epilepsy and other conditions, neurochemistry, neurodegeneration.

Research Technician Sandeep Mangat (Supervisor Dr. Benedict Albensi)
B. Michel Aliani

University of Manitoba, Department of Food & Human Nutritional Sciences

- Course Number and Title: HNSC 7170_Advanced problems in Nutrition
- Course Number and Title: HNSC 2150_Composition, functional and nutritional properties of foods
- Course Number and Title: HNSC 4570_Sensory evaluation of foods
- Course Number and Title: HNSC 4510_Food product development
C. Dr. Renée Douville

University of Winnipeg

- BIOL4111 Biology Honours Thesis (6 credit hr, 4th year undergraduate level). I coordinate the program and present 11 lectures on scientific writing and career development.
- BIOL4931 Immunology (3 credit hr, 3/4th year undergraduate level). I coordinate the entire course and present 19 lectures on innate and adaptive immunology.
- BIOL4950 Human Neurobiology (3 credit hr, 3/4th year undergraduate level). I coordinate the entire course and present 17 lectures on neurobiology and neurological disease.

D. Paul Fernyhough

University of Manitoba

- Drugs and human disease (PHAC 4040) (2 x 3 credit hr 3/4th year undergraduate and 1st yr graduate level). I present 2 lectures on antiviral pharmacology.
- Molecular Pharmacology (PHAC 7222) (3 credit hr - 2nd year or above graduate level) – 12 lecture unit – I present 2 lectures on growth factor receptors, tyrosine kinases and associated receptors and one tutorial on critique of manuscript.
- Neuroscience (IMED 7101 and 7102) (6 credit hr - 1st/2nd yr graduate level) – coordinator of neurobiology of disease segment. Deliver 3 lectures on neurotrophins, transcription factors and peripheral neuropathy and mark dissertations.
- Pharmacology (PHAC 2100) (6 credit hr – Pharmacy course) – I deliver 10 lectures each year covering antivirals (2 hr), antifungals (1 hr), diabetes (2 hr), pain drugs (4 hr) and GI tract (1 hr).
- Pharmacology (PHAC7230/7240) (6 credit physician assistant course) – I deliver 4 lectures each year on antivirals, antifungals, GI tract and diabetes.
- Neuropharmacology (PHAC 7162) (1.5 credit hr – 2nd yr and above graduate level) – deliver 2 lectures on neuronal growth factors and PNS disease.
- Pharmacology (ORLB3320) – 3rd year undergraduate dentistry course – I deliver 3 lectures. Pharmacology (RESP1440) – 1st year respiratory medicine course – I deliver 1 lecture.
E. Dr. Gordon Glazner

University of Manitoba, Department of Pharmacology & Therapeutics

- Drugs and human disease (PHAC 4030) (2 x 3 credit hr 3/4th year undergraduate and 1st yr graduate level).
- Dentistry – General Pharmacology course (ORLB 3320) (6 credit hours course for 2nd year dentistry students)
  Total of 60 hours of contact

F. Dr. Miyoung Suh

University of Manitoba, Department of Food & Human Nutritional Sciences

- HNSC 7560 Current Topics in Lipid Nutrition
- HNSC 7460/ANSC7460 Lipid Nutrition and Metabolism
- HNSC 4600 Practice-Based Research in Human Nutritional Sciences (Co-teaching (85%) with Research Dietitian, Manitoba Partnership Dietetic Education
- HNSC 4320 Nutritional Management of Disease States (100%) (with laboratory, 2 sessions x 2 hours per week)
Postdoctoral Fellow Dr. Farhana Naznin & undergraduate student Ms. Annie Jiang (Supervisor: Dr. Paul Fernyhough)

L-R Undergraduate Serena Phillips & Graduate Student Shayan Amiri (Supervisor: Dr. Paul Fernyhough)
7. Publications (including Book Chapters)

A. Benedict Albensi

1. Md Imamul Islam; P. Nagakannan; T. Shcholok; Fabio Contu; Sabine Mai; B.C. ALBENSI; M.R. Del Bigio; J.-F. Wang; Md Golam Sharooar; Riqiang Yan; Il-Seon Park and E. Eftekharpour. Regulatory role of cathepsin L in induction of nuclear laminopathy in Alzheimer’s Disease. Aging Cell. #ACEL13531, Accepted.

2. D.A Davies, A. Adlimoghaddam, B.C. ALBENSI, Role of Nrf2 in synaptic plasticity and memory in Alzheimer's disease. Cells. 10(8):1884. 2021


Undergraduate students Alana Slike
(Supervisor: Dr. Benedict Albensi)
B. Dr. Michel Aliani


C. Renée Douville

D. Dr. Paul Fernyhough


E. Dr. Gordon Glazner

**F. Dr. Mandana Modirrousta**


Dr. Mandana Modirrousta demonstrates rTMS equipment with her research associate Ben Meek.

Image credit CBC News

G. Dr. Darrell Smith


H. Dr. Miyoung Suh

1. Walchuk, C, House JD, Aliani M, Suh M (2021) Lutein and docosahexaenoic acid enriched egg consumption improves retina function in healthy Caucasian older adults (Accepted to J Func Foods: JFF-D-21-01483)


8. Conference Contributions

A. Dr. Michel Aliani

1. Cereals and Grains Symposium (Nov 18, 2021) Effect of RevTech on split yellow pea, Speaker Michel Aliani

2. International Alliance of Clinical and Forensic Toxicology (IACFT 03 Nov, 2021). Keynote Speaker: Urinary Metabolomics, a powerful tool to explore endogenous and exogenous compounds for the discovery of novel markers

3. Pangborn Symposium August 2021. 3 Posters presented a. Ronak Fahmi and Michel Aliani: Sensory and Physiochemical characteristics of thermally treated split yellow pea flour in pan bread

4. Donna Ryland, John Thoroski and Michel Aliani: Effect of saskatoon berry powder on the sensory attributes and acceptability of low-fat frozen yogurt

5. Heather Blewett, Dan Ramdath and Michel Aliani: Consumer acceptability of whole and split yellow peas in two different matrices (chili & muffin) evaluated in two settings (consumer panel & by participants in a clinical trial)


B. Renée Douville


C. Dr. Paul Fernyhough


D. Dr. Miyoung Suh


5. Kapourchali FR, Louis XL, Feltham BA Eskin NAM & Suh M (2021) Fatty acid compositions of immature and mature testis are differently responsive to dietary docosahexaenoic acid during development in rats exposed to prenatal ethanol, 14th International Society for the Study of Fatty acids and Lipids (ISSFAL, 2021) & American Oil Chemistry Society (on line) May 10-14, 2021

9. Invited Presentations, Scholarly & Outreach Activities

A. Dr. Benedict Albensi

INVITED ORAL PRESENTATIONS

- ISTAART NMD PIA, Alzheimer’s Assoc. USA Webinar Series, virtual. 2021
  Nova Southeastern University, College of Pharmacy, Ft Lauderdale, FL, USA

- R42 Institute Longevity Series. “Why are we Alive? Mitochondria and Aging”.

RADIO, TELEVISION, NEWSPAPER, & YOUTUBE INTERVIEWS

Broadcast

http://stbhf.convio.net/site/Calendar?id=100201&view=Detail

https://podcasts.apple.com/ca/podcast/the-start/id1178069790?i=1000542372519

2021 The Power of Story and Science Podcast. Interview with David P. Otey on Science, Innovation, and Creativity

Board of Director Appointments

9/2020-21 Director on Board of Directors, Brain Injury Association of Manitoba (non-profit), Winnipeg, MB

9/2015-21 Director on Board of Directors, MitoCanada (non-profit), Brantford, ON

International and National Committees

7/2021 Chair - ISTAART-Alzheimer’s Association, Nutrition, Metabolism, & Dementia PIA Executive Committee, Chicago, IL, USA

10/2020-21 Vice Chair - Chair-elect (elected by international online ballot), ISTAART-Alzheimer’s Association, Nutrition, Metabolism, & Dementia PIA Executive Committee, Chicago, IL, USA

9/2018- Co-Chair Systems Integrity Team (SASI Leadership Team) - ACRES (Alliance for Clinical Research Excellence and Safety) Global, HQ-Boston, MA, USA

4/2018- Chair of Weston Study Multi-site Multi-national Clinical Data (rTMS-AD study) and Safety Monitoring Board (DSMB) - Canada & Australia
International and National Grant Review Committees

2021  External Review. **MUREP** Innovation and Technology Transfer Idea Competition (MITTIC) – **NASA**.

State or Provincial Committees and/or Campaigns

2021  January is Alzheimer’s Awareness Month – in cooperation with Alzheimer’s Soc. of Manitoba. Media, newspaper announcements.

**EDITORIAL**

**Editorial Boards**

2020- **Editor-in-Chief**, *Molecular Neurobiology*, Springer-Nature Pub., NY, USA

2020- **Senior Editor** *Journal of Alzheimer’s Disease*. IOS Press Pub., Netherlands

**Manuscript Ad Hoc Referee**

<table>
<thead>
<tr>
<th>Year</th>
<th>Journal/Conference</th>
</tr>
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<tbody>
<tr>
<td>2021-</td>
<td>Acta Neurologica Scandinavica</td>
</tr>
<tr>
<td>2011-</td>
<td>CNS &amp; Neurological Disorders – Drug Targets</td>
</tr>
<tr>
<td>2010-</td>
<td>PloS ONE</td>
</tr>
<tr>
<td>2009-</td>
<td>Drug News and Perspectives</td>
</tr>
<tr>
<td>2009-</td>
<td>British Journal of Pharmacology</td>
</tr>
<tr>
<td>2009-</td>
<td>Molecular and Cellular Biochemistry</td>
</tr>
<tr>
<td>2008-</td>
<td>BMC Neuroscience</td>
</tr>
<tr>
<td>2008-</td>
<td>Canadian Journal of Physiology and Pharmacology</td>
</tr>
<tr>
<td>2014-</td>
<td>Annals of Biomedical Engineering</td>
</tr>
<tr>
<td>2013-</td>
<td>British Journal of Medicine &amp; Medical Research</td>
</tr>
<tr>
<td>2013-</td>
<td>Cerebral Cortex</td>
</tr>
<tr>
<td>2007-</td>
<td>Neuromolecular Medicine</td>
</tr>
<tr>
<td>2005-</td>
<td>Neurobiology of Aging</td>
</tr>
<tr>
<td>2004-</td>
<td>Epilepsia</td>
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<tr>
<td>2002-</td>
<td>Brain Injury</td>
</tr>
<tr>
<td>2002-</td>
<td>Journal of Neuroscience</td>
</tr>
<tr>
<td>2001-</td>
<td>Journal of Molecular Neuroscience</td>
</tr>
<tr>
<td>2000-</td>
<td>Journal of Neurochemistry</td>
</tr>
<tr>
<td>1999-</td>
<td>Investigative Radiology</td>
</tr>
<tr>
<td>1999-</td>
<td>Journal of Neuroscience Research</td>
</tr>
<tr>
<td>1998-</td>
<td>Hippocampus</td>
</tr>
</tbody>
</table>
B. Dr. Michel Aliani

Memberships
Institute of Food Technology (IFT)  2014 to present
Metabolomics Society 2014 to present
Analytical Chemistry 2014 to present
Canadian Centre for Agri-Food Research in Health and Medicine (CCARM) 2014 to present

Service/Outreach/Other Committees
- Outreach Committee  Effective 01 July 2021    Chair of the committee
- HNS Program Committee  Effective 01 July, 2021   Member
- Tenure and Promotion Committee  Effective 01 July, 2021 Member

Reviewing Activities
- Review panel - Journal of Food Science, Metabolomics, Journal of foods and Agricultural Chemistry

Editorial Activities
Journal of Foods  March 01, 2021

Advisor to Health Canada: At their request, I have been in several online discussion with Health Canada representatives in Ottawa which were mainly related to sensory evaluation and flavour chemistry studies of several health products (Confidential discussion). On a positive note, there will be a possibility for a potential collaboration with Health Canada to conduct some of these evaluations at the U of M once the COVID 19 restrictions will permit proper sensory studies.
C. Dr. Renée Douville

Committees:

**Departmental (Biology) and University of Winnipeg committees**

- Departmental Review committee (2020 – Present)
- Departmental Greenhouse committee (2020 – Present)
- UW Research Committee (2019 – Present)

**Research committees**

- Chair (2019-Present) & Committee Member, NSERC Scholarships and Fellowships Selection Committee for Cellular and Molecular Biology (#187, 2018-2021)

**Editorial Service**

- Editor, Journal of Neuroimmunology 2021/03 – Present

**Consulting Services**

- Science Advisory Council VINEx initiative 2020/05/26 – Present
  *Coordination by Inez Jabalpuwala from Rocket Science Health
  Advisement for studies on COVID-19 and other viral neurological conditions*

**Artistic Works**

Dura Mater: Reflections on Neurofeminism / MNN & MAWA collaboration
Artist partner: Bonnie Marin June 2019 – July 2021

**Society Memberships**

- ALS Canada
- Society for Neuroscience (Manitoba Chapter)
- Canadian Society for Immunology
- Schizophrenia Society of Canada
- International Society for Neuroimmunology
- International Society for Neuroviology
D. Dr. Gordon Glazner

Grant Review

- Panel member, CIHR neuroscience B grant review committee

Editorial

- Ad Hoc reviewer: Journal of Neuroscience, Journal of Neurochemistry, Brain Research, Experimental Neurology

Teaching

- Coordinator: PHAC7230 & 7240 This is a 6 credit pharmacology course specifically designed for Physician Assistants who have already graduated university. This course is taught by ~20 lecturers and is generally attended by 15-20 students.
- PHAC 2100, General Pharmacology. This is a 6-credit, primary introductory pharmacology course designed for Pharmacy students. The course is taught by over a dozen lecturers, and is generally attended by 75-80 students.

Membership

- Member, Society for Neuroscience 1994-present

PhdD Student Pranav Mishra (coSupervisors Drs. Ben Albensi & Paul Fernyhough)
E. Dr. Paul Fernyhough

Invited Talks:


Other current activities:

2007 – present College of Medicine Promotions Committee, Basic Sciences Representative
2012 – present Canadian Institutes of Health Research (CIHR) – Cell Biology and Mechanisms of disease panel
2015 – present Head of Department of Pharmacology & Therapeutics, University of Manitoba
2015 – present Member, Faculty of Health Sciences (FHS) Executive Council
2015 – present Member, College of Medicine Research Advisory Committee
2015 – present Member, College of Medicine Research Support Fund (RSF) Adjudication Committee
2015 – present Member, College of Medicine Department Head’s Council
2015 – present Member of FHS core platform review committee
2015 - present International Diabetic Neuropathy Consortium, Universities at Aarhus and Copenhagen in Denmark and Oxford, UK and Ann Arbor, USA. Funded by Novo Foundation, Denmark. Member of advisory board.
2018 – present Member of University of Manitoba Tricouncil bridge funding review panel
2005 – present NIH research study section – NINDS Clinical Neuroplasticity and Neurotransmitters (CNNT) Study Section – March 2005 to 2010 and then Oct 2014 onwards as ad hoc reviewer.
F. Dr. Miyoung Suh

Awards
- AKCSE Women in Science and Engineers (WiSE) Award, The Korean Federation of Science and Technology Societies (Awarded at the 11th Annual CKC meeting, Sept 1-4, 2021, Halifax, Nova Scotia)

Invited Talks
- Omega 3 fatty acids and Little Red Riding Hood: All the better to SEE you with!! The Association of Korean-Canadian Scientists and Engineers (AKCSE), Seminar Series, Nov 4, 2021
- Smart farming technology to improve Indigenous health in Northern Manitoba Youth BioLab, SBRC, Dec 2, 2021

Graduate Student Bradley Feltham (Supervisor Dr. Miyoung Suh)
10. Visiting Speaker Program

The Division of Neurodegenerative Disorders, the Neuroscience Research Program located within the Kleyyen Institute for Advanced Medicine at the Health Sciences Centre, and the Department of Pharmacology & Therapeutics, University of Manitoba, conjointly participate in funding the Manitoba Neuroscience Networks’s Seminar Series/Visiting Speaker Program. The Manitoba Neuroscience Network’s administrative office is located within the Division of Neurodegenerative Disorders.

Seminar & Visiting Speaker Series (2021)

- January 18, 2021 Dr. Jibran Y. Khokar, PhD  
  Assistant Professor, Department of Biomedical Sciences, University of Guelph
- January 25, 2021 Dr. Adema Ribic, PhD  
  Assistant Professor, Department of Psychology, University of Virginia
- January 29, 2021 Dr. Eftekhar Eftekharpour  
  Department of Physiology & Pathophysiology
- February 26, 2021 Dr. Stephanie Booth  
  Department of Medical Microbiology & Infectious Diseases
- March 8, 2021 Dr. Derya Sargin, PhD  
  Assistant Professor, Department of Psychology, University of Calgary
- March 15, 2021 Dr. Karun K. Singh, Ph.D.  
  Senior Scientist, Krembil Research Institute, University Health Network (UHN), Associate Professor, Faculty of Medicine, University of Toronto
- March 26, 2021 Dr. Galen Wright  
  Department of Pharmacology & Therapeutics
- April 30, 2021 Dr. Ji Hyun Ko  
  Department of Human Anatomy and Cell Science
- May 28, 2021 Dr. Marcus C. Ng  
  Department of Internal Medicine (Neurology)
- October 29, 2021 Dr. Saeid Ghavami  
  Department of Human Anatomy and Cell Science
- November 26, 2021 Dr. Marc R. Del Bigio  
  Department of Pathology, Department of Human Anatomy and Cell Science
11. News releases and other misc. announcements

2021 Manitoba Dementia Journal Club: Dr. Albensi heads up the Dementia journal club that started several years with the effort of Dr. Gough (Dept. Chemistry at the Univ. of Manitoba). With a common goal of uniting researchers across Winnipeg, across faculties, and across departments, the club began with a focus on Alzheimer’s dementia, but has since expanded to include all forms of dementia. Currently the group meets monthly at various Winnipeg locations, but with many meetings occurring at the University of Manitoba, Ft. Garry, HSC, and St. Boniface. Learn more about Dementia Research Manitoba at: https://dementiamanitoba.wixsite.com/mysite

Where Basic, Translational, and Clinical Research Meet
We are a group of scientists, physicians, administrators, and other healthcare professionals devoted to high quality dementia research in Manitoba. To attend our club or for more information contact:

Dr. Benedict C. Albensi, Chair
204-235-3942
DementiaManitoba@outlook.com

Smart vertical farming to expand in Northern Manitoba

July 2021: Principal Investigator and UM professor Dr. Miyoung Suh will work with Opaskwayak Cree Nation (OCN) to develop a smart vertical farming initiative for the community that will benefit many Manitobans. This is part of The Implementing Smart Cities Interventions to Build Healthy Cities (SMART) Training Platform, for the City of Guelph, City of Montreal and Opaskwayak Cree Nation located in the town of The Pas, co-led by Suh.
July 5 2021

The Implementing Smart Cities Interventions to Build Healthy Cities (SMART) Training Platform is led by Professor David Ma at the University of Guelph, Professor Laurette Dubé at McGill University, and Professor Miyoung Suh at the University of Manitoba. These researchers and their team of collaborators will develop a curriculum to equip trainees at 10 institutions across the country with the knowledge and skills to tackle many of the challenges faced in urban environments. The trainees will engage in implementation science; that is, examining whether a particular practice works by testing it in the real world and understanding how to adapt it so that it works best in different regions, under different conditions, and with different populations. Three federal granting agencies – the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC) – are each contributing one-third of the funding for the Platform.


Jul 5, 2021

Investing in Science-Based Solutions to Improve Health and Well-Being in Urban Areas

Education, Giving, Policy & Data, Research, Resources

Photo by Julian Haidemaker on Unsplash
May 4, 2021

PhD Candidate receives three awards in a row!

Congratulations to Pranav Mishra, PhD candidate working for the Synaptic Plasticity and Cellular Memory Dysfunction Lab, who has been awarded two major grants and also took first place in the Manitoba Neuroscience Network photo contest. Mishra is co-supervised by Dr. Benedict Albensi and Dr. Paul Fernyhough, Principal Investigator, Cell Biology of Neurodegeneration Lab, Division of Neurodegenerative Disorders.

Mishra has been named this year’s recipient of the McCrorie-West Family Fellowship for Alzheimer Research, a fellowship award to support promising students who plan on making a career in research for the treatment or cure of Alzheimer disease.

He also earned the Dr. Mark Nickerson Grad Entrance Scholarship in Pharmacology and Therapeutics, award which recognizes the most academically deserving student entering the graduate studies program in a given calendar year.
JULY 21, 2021 — PhD student Bradley Feltham for receiving the 2021 Emerging Leaders Award.

The University of Manitoba pleased to announce the 2021 recipients of the Emerging Leader Awards. The Emerging Leader Award is a way the University of Manitoba recognizes the outstanding contributions that students make to the enhancement of the institution and our community. Introduced in 2006, it has recognized students who have demonstrated a commitment to furthering our educational mission by contributing to the social, cultural, or economic well-being of communities on and off campus.

Congratulations to PhD Student Brad Feltham (supervisor Dr. Miyoung Suh) for being awarded the following awards throughout 2021.

- University of Manitoba Faculty of Graduate Studies Research Completion Scholarship;
- Garson N. (Gerry) Vogel Memorial Award;
- Prairie Indigenous Knowledge Exchange Network PIKE-Net Graduate Fellowship;
- Doctoral Award for Indigenous Students;
- University of Manitoba Doctoral Award for Indigenous Students;
- Research Manitoba-Children’s Hospital Research Institute of Manitoba PhD in Health Research Studentship Award (declined);
- University of Manitoba Faculty of Graduate Studies Fellowship (UMGF);
- Honorable Mention poster competition 17th Annual Child Health Research Days. Winnipeg, MB.
PhD Student Pranav Mishra (Supervisor Dr. Paul Fernyhough) became Student President for the Department of Pharmacology & Therapeutics, University of Manitoba

Shayan Amiri (Supervisor Dr. Paul Fernyhough) joined the executive of the HSGSA (Health Sciences Graduate Student Association) as VP St. Boniface.

PhD Student Pranav Mishra wins Health Sciences Graduate Students’ Association (HSGSA) Summer Photo Contest

Even Mr. Bean wants us to wear a mask!
2021 Manitoba Neuroscience Network (MNN) Trainee Photo Contest:

Our first photo contest celebrating the research works of our trainees! Representative photos/images were shared in our social medial accounts and voted on by the public. The winner of the contest received a $100 gift card to Brazen Hall.

WINNER:

Pranav Mishra
PhD Student
Supervisor: Dr. Paul Fernyhough
2021 BRAIN AWARENESS WEEK

For Brain Awareness Week in 2021, there was the Cafe Scientifique on March 15th. The title was "Research in motion: the latest advances in Parkinson's disease". The speakers were Drs. Doug Hobson, Tony Szturm, and Ji Hyun Ko. There were no in person events obviously, so our activities that week were rather limited. We did hold an Instagram photo contest for students.

The Winnipeg Brain Bee was held June 4, 2021, and our winner, Antoni Klonowski, went on to win the Canadian National Brain Bee and place 3rd at the International Brain Bee.

Finally, we had the Dura Mater: Objective/Subjective art exhibition, which was a partnership with Mentoring Artists for Women's Art (MAWA). It was held May 13-September 12, 2021 at the Buhler Gallery at St. B.

Neuroscience for Kids!

We took the free Neuroscience for Kids Activities from our cancelled 2020 BAW schedule and made it virtual. This included:

- The brain hat
- Play-Doh brains
- Protect the brain - egg drop challenge
- Pipe cleaner neurons
- Neuroscience coloring book

Check out our Instagram IGTV Channel for some cool videos!

Trainee photo contest

Our first photo contest celebrating the research works of our trainees! Representative photos/images were shared on our social media accounts and voted on by the public. The winner of the contest received a $100 gift card to Brazen Hall.

WINNER:

Pranav Mishra, Ph.D. student
Supervisor: Dr. Paul Fernyhough
Lung cancer is the most commonly diagnosed cancer in men and women combined (Canadian Cancer Society, 2021). Detection of cancer-specific metabolites in the early stages of lung cancer is made difficult due to the small size of tumours and the absence of cellular specificity of almost all metabolites. However, the power of metabolomics may allow for the non-invasive detection of early stages of lung cancer.

Michel Aliani’s team recently published a paper in PLoS ONE, entitled “Comparative metabolomics studies of blood collected in streck and heparin tubes from lung cancer patients”. The pilot study was undertaken to determine the effect of blood collection tube (BCT) (Streck vs. Heparin), blood location (venous vs. arterial), and sex, on the metabolic profile of cancer patients suffering from various types of lung tumours.

“We are excited to share this work, particularly through PLoS One’s ‘open to all’, fully transparent portal. All raw materials have been uploaded to their public repository, which in my opinion is incredibly vital in order for the whole world to have access to this data,” Aliani explained.

This work provides further insight into the preferred blood collection tube that should be used for improved lung cancer detection and a better understanding of the metabolic variations of different tumour types.

Albensi paper suggests how Covid-related neurological symptoms such as headaches, coma and brain-fog could be treated with therapeutics targeting pathways prone to inflammation.

Jun 3, 2021 | DND News, Home News | 0 comments

The paper titled: The Effect of COVID-19 on NF-κB and Neurological Manifestations of Disease was published today in a special issue on COVID-19, in Molecular Neurobiology, and shows how therapeutics that reduce the NF-κB pathway should be considered in the treatment of COVID-19 and its effects on neurological function.

The work was led jointly by Dr. Aida Adlimoghaddam and Dr. Don A. Davies, post-doctoral fellows at the Synaptic Plasticity & Memory Dysfunction Lab, led by Dr. Benedict Albensi Principal Investigator, Division of Neurodegenerative Disorders at St. Boniface Hospital Research.
12. Commercialization

A. WinSanTor

Founded in 2011, WinSanTor Inc. is a clinical-stage biotechnology company focused on the discovery and development of treatments for peripheral neuropathies, including diabetic peripheral neuropathy, chemo- and HIV-induced peripheral neuropathy, and others. Visit their website: https://winsantor.com

During 2021, the commercialization associated with WinSanTor Inc., where Dr. Fernyhough is a co-founder, has progress further. The Phase 2 trials in Canada are now complete and a plan to initiate Phase 3 by end of 2022.

Study finds drugs that can reverse nerve damage.

People who suffer from chronic numbness or pain and tingling in their extremities, caused by diabetes or other conditions, might soon get relief. A study by an international team of researchers has found that a class of drugs prescribed for other medical issues such as nearsightedness, incontinence or peptic ulcers may also prevent numbness and pain in fingers, arms and legs.

Led by Dr. Paul Fernyhough of the University of Manitoba and St. Boniface Hospital Albrechtsen Research Centre, and Dr. Nigel Calcutt of the University of California at San Diego, the researchers found that antimuscarinic drugs such as pirenzepine can

Read more on the founders: https://winsantor.com/the-winsantor-team/
reverse the numbness and pain, called neuropathy, often experienced by people with diabetes, HIV, or as a side effect of cancer chemotherapy.

Fernyhough notes: “The costs of treating these diseases and associated morbidities exceed the costs for treating breast cancer. For the first time we have identified a new class of drugs that can reverse nerve damage in animal models of these diseases.”

In peripheral neuropathy the nerve endings of the peripheral nerves die leading to severe impacts on quality of life. For example, patients suffer from intractable pain, foot ulcers, infections and ultimately amputations. There are presently no treatments other than palliative care. The study found that widely-used drugs targeted a key receptor in the neural pathway regulating the growth of nerve fibres and stimulated their regeneration. The drugs drive nerve fibre regeneration and repair in disease states such as diabetes and chemotherapy where there is otherwise irreversible nerve damage.

Calcutt, Fernyhough and Lakshmi Kotra of the University of Toronto together have founded the biotech company WinSanTor Inc to specifically develop the therapeutic potential of this novel approach to treating neuropathy.

“This data opens the possibility that the process of peripheral nerve degeneration may be therapeutically reversible, and now with the potential to use existing drugs, we can rapidly translate these findings to clinical trials,” says Stanley Kim, co-founder and CEO of WinSanTor Inc. “Peripheral neuropathy is a major and often neglected health problem affecting hundreds of millions of people around the world, including a majority of diabetes patients, and we can’t afford to wait any longer in advancing treatments for this disease.”

Fernyhough adds: “An exciting aspect of the work is that these are new uses for old drugs. They have been used in humans for over 20 years with no serious side effects and have an excellent safety profile. We expect Phase 1 trials to progress smoothly with Phase 2 trials arranged and already funded for 2017.”

“We are proud of Dr Fernyhough’s exciting finding and the clinical implications of this discovery,” says Dr. Grant Pierce, Executive Director of Research at St Boniface Hospital. “It is another example of the successful history at St Boniface Hospital of translating our lab bench findings into valuable medical applications to benefit the health of Canadians.”

“I congratulate Drs. Fernyhough and Calcutt on their findings,” says Dr. Digvir Jayas, Vice-President (Research and International) and Distinguished Professor at the University of Manitoba. “This research will benefit millions of people who are affected by chronic diseases.”

The results of the study were published in 2017 in the Journal of Clinical Investigation. The research was funded by grants from the JDRF, the Canadian Institutes of Health Research, and the National Institutes of Health, with support from St. Boniface Hospital Foundation.