Parkinson Canada

Funded Researcher Profiles

2024

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Pilot Project Grants

Prof. Frédéric Bretzner

Université Laval

Functional contribution of Mesencephalic Locomotor Region nuclei in chronic Parkinson's disease

$75,000 over one year

Main Takeaway: Our project aims to find the best DBS targets and settings in the brainstem to enhance movement recovery in chronic Parkinson's disease. This research will deepen our understanding of brainstem populations and their role in movement recovery in advanced Parkinson's disease.

Project Description: Deep Brain Stimulation (DBS) is a treatment for advanced Parkinson's disease when medication isn't effective. Due to their role in movement initiation, brainstem nuclei have emerged as potential DBS targets. While some brainstem nuclei can improve walking and posture in some patients, outcomes vary widely in clinical studies. Our project aims to find the best DBS targets and settings in the brainstem to enhance movement recovery in chronic Parkinson's disease. By using optogenetic tools in a mouse model of advanced Parkinson's, we will monitor changes in specific brainstem neurons linked to movement symptoms, such as difficulty in walking. This will help identify which neural populations to activate or inhibit for symptom relief. The study will also compare the effectiveness of optogenetic methods with that of standard electrical stimulation.

Importance of Funding: Thank you for your generous support of our research on Deep Brain Stimulation (DBS) for Parkinson's disease. Your funding is critical as it will allow us to explore new areas of the brain that could potentially improve treatment outcomes for patients who have limited options. Specifically, your support will enable us to focus on the pedunculopontine nucleus (PPN) and the cuneiform nucleus (CnF), areas of the brain we believe are key in controlling movement and posture.

Future Research Goals: I hope to optimize the efficacy of DBS therapy by refining stimulation parameters, identifying optimal target regions within the brain, and developing personalized approaches tailored to individual patients. I also hope to improve safety and minimize side effects by seeking ways to minimize adverse effects and risks associated with DBS, through advances in surgical techniques and stimulation protocols. I also hope to better understand mechanisms of action by deepening the understanding of how DBS modulates neural circuits to produce therapeutic effects. Using optogenetic tools, I hope to advance DBS technology through the development of novel stimulation paradigms and closed-loop systems to improve precision, efficacy, and patient outcomes.

Dr. Veronica Bruno

University of Calgary

Women's health in Parkinson's disease

$72,500 over one year

Main Takeaway: Our project aims to understand the unique experiences and challenges faced by women with Parkinson's disease (PD) in Canada. We focus on both motor and non-motor symptoms, especially those often overlooked, like pain and sexual dysfunction.

Project Description: We use patient-centered focus groups, which means we gather women with PD to discuss their experiences in a supportive environment. This allows us to hear directly from those affected by the disease. We also conduct a nationwide survey to collect broader data. These methods ensure that our research reflects real-life experiences and addresses the most pressing issues faced by women with PD. Our research will significantly impact the lives of women with Parkinson's disease by providing a deeper understanding of their specific symptoms and challenges. This will lead to more effective treatment strategies and improved symptom management, especially regarding pain, hormonal changes, and sexual health. Ultimately, our findings will contribute to enhancing the overall quality of life for women with PD.

Importance of Funding: This funding allows us to fill a critical gap in Parkinson's research by focusing on women. With this support, we can gather essential data and insights that will lead to better, more tailored treatment options and care strategies. Ultimately, this will improve the quality of life for many women living with Parkinson's disease.

Future Research Goals: During my career, I aim to advance our understanding of Parkinson's disease, particularly in under-researched areas such as women's health. I hope to develop new, more personalized treatment strategies that consider gender differences. Additionally, I want to create comprehensive support systems and educational programs for patients and healthcare providers to ensure that all individuals with Parkinson's receive the best possible care.

Prof. Kaylena Ehgoetz Martens

University of Waterloo

An integrative mind-body approach involving cognitive behavioural therapy to improve freezing of gait

$75,000 over one year

Main Takeaway: This pilot project aims to integrate physical exercises with psychological strategies to individually tailor freezing of gait therapy offered by an integrated team of experts (neurologist, physiotherapist, psychiatrist).

Project Description: Freezing of gait (FOG) is one of the most troublesome symptoms for people living with Parkinson's disease, because often it causes falls, injuries, hospitalizations and ultimately a loss of mobility which significantly affects quality of life. This project will evaluate a combined physical exercise/psychological intervention to address FOG in a smaller pilot project setting to determine efficacy before scaling it up and performing a larger study. The severity of FOG will be measured before participating in the program and shortly after the program is over. During the intervention, the person living with Parkinson's disease will meet with their integrative care team every 2 weeks for 1 hour therapy sessions for 12 weeks. In between therapy sessions, the participant will be able to practice the strategy and exercises that were introduced during the therapy session. After the intervention, participants can take part in an exit survey to share their thoughts and feedback about the program.

Importance of Funding: This funding will allow us to collect the necessary preliminary data to justify and plan a larger clinical trial and apply for further government funding for this Parkinson's specific rehabilitation program. Without funding such as this, it can be really tough to gather enough evidence to show the government agencies that a research project such as this can be successful and a worthy investment.

Future Research Goals: The goal with this study, beyond this particular grant, is to give physiotherapists and trained experts a unique therapeutic toolkit to treat freezing of gait in a holistic manner. If we can demonstrate the necessary evidence for the efficacy of this approach, then we can train allied healthcare providers, and offer access to therapeutic interventions to preserve mobility and combat freezing of gait in PD. In my career, I hope to contribute to biomarker tracking to elevate successful neuroprotective trials for those with prodromal PD. I hope to provide alternative options for patients to take control and track their disease progression with digital outcomes, and finally to understand the cause of FOG to implement effective therapies to maximize mobility and preserve quality of life for those already living in the advanced stages of disease.

Dr. Chris Phenix

University of Saskatchewan

Measuring GCase and GBA2 activities in leukocytes from blood and saliva

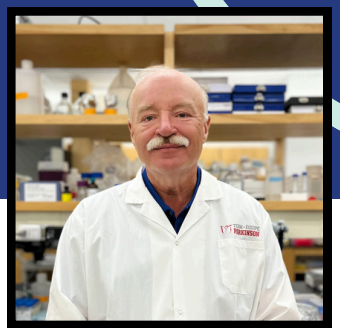
Funded in Partnership with the Saskatchewan Health Research Foundation
$74,925 over one year

Main Takeaway: The overall goals of this project are to use our new more powerful chemical tools and adapt existing methods to develop clinically relevant ways to measure lysosomal GCase activity in human samples. This will help us improve diagnostic tools for Gaucher disease.

Project Description: An inherited deficiency in lysosomal Glucocerebrosidase (GCase or GBA) leads to Gaucher disease (GD), the most common lysosomal storage disorder. Accurately providing the diagnosis and prognosis of GD, especially neuropathic forms which affect children, remains a challenge due to genotype-phenotype discordance and the limitations of existing clinical tests used to measure GCase in patient samples. Further, various therapeutic strategies to restore GCase activity, especially patients who display neurological symptoms, are at various stages of preclinical and clinical development and would benefit from methods to quantify lysosomal GCase activity. These tests we're evaluating may provide early critical insight into disease severity and assist with the validation of GCase-restoring therapies.

Dr. George Robertson

Dalhousie University



Nanoparticle drug delivery of IRX4204 to protect and repair the neurovascular unit in Parkinson's disease

Made possible thanks to a generous donation from Sheila Bannon and her late parents, Eileen and Doug Bannon, in loving memory of their sister and daughter, Jane Bannon - $75,000 over one year

Main Takeaway: Our goal is to determine whether the intranasal delivery of IRX4204-LNPs safely reverses walking (gait) deficits typical of Parkinson's disease in an experimental mouse model, with potential future development as a new treatment for Parkinson's disease.

Project Description: Lipid nanoparticles (LNPs) delivered intranasally can deliver drugs into the brain, so pairing medications that may impact Parkinson's but that can't cross into the brain themselves with LNPs is a way to improve medication delivery. IRX4204 is an investigational drug that has been shown to improve the movement of individuals afflicted with Parkinson's disease, but it does not readily enter the brain and may elevate fat levels in the blood to unsafe levels by acting on cells outside of the brain. Should our studies show that the intranasal delivery of IRX4204-LNPs reverses gait deficits in this mouse model without increasing fat levels in the blood, we would be well positioned to develop them as a new treatment for Parkinson's disease.

Importance of Funding: When speaking with patients and community groups, I often describe how Canadian scientists and clinicians have played a key role in improving our understanding of the neurodegenerative event responsible for Parkinson's disease and the development of drugs used to treat this crippling disorder. I provide the necessary background for patients and families to appreciate how my research funded by Parkinson Canada is designed to develop new treatments for Parkinson's disease. In the case of the present project, nose-to-brain delivery of lipid nanoparticles offers a safe, rapid, convenient and effective method for delivering drugs to the brain that slow the neurodegenerative events which drive disease progression.

Future Research Goals: Our nose-to-brain drug delivery approach should not only enhance the clinical effectiveness of IRX4204 but also improve the safety of this drug by preventing an elevation of fat levels in the blood. Lastly, taking IRX4204 lipid nanoparticles in the form of a nasal spray would be rapid, painless and convenient for the patient. The goal of my research is to employ my expertise to develop treatments like this for Alzheimer's disease, multiple sclerosis, stroke and Parkinson's disease that act by protecting and repairing the brain.

Prof. Denis Soulet

Université Laval

Investigation of neuroprotective and neurorescue properties of zuranolone in a mouse model of Parkinson's disease

Funding generously provided by the Della Vedova family
$75,000 over one year

Main Takeaway: We are evaluating if zuranolone can prevent dopamine cell loss and rescue already affected dopamine cells. We anticipate zuranolone to be better than allopregnanolone to protect and rescue dopamine cells, and research with zuranolone already tested in humans could rapidly be used for Parkinson's disease treatment.

Project Description: There is yet no treatment to prevent/stop/delay Parkinson's disease but symptomatic treatments are available. Neuroprotection with steroids in animal models of Parkinson's disease is well documented. A study reported a reduction of tremor in Parkinson's disease patients treated with zuranolone, a synthetic analog of allopregnanolone, which is a naturally occurring metabolite of progesterone. Zuranolone is approved to treat depression. A potentially protective increase of allopregnanolone occurs at early stages of Parkinson's disease, followed by a decrease at later stages that may exacerbate the brain pathological changes. Our hypothesis is that zuranolone will prevent the death of brain dopamine producing cells. We will test zuranolone compared to progesterone administered and measure the protection against dopamine loss and the mechanisms implicated, as well as rescue of affected dopamine neurons.

Importance of Funding: I am very grateful for the financial support to perform this research on zuranolone. This project will provide a great opportunity to test a new class of drugs to treat Parkinson's disease. We hope that the knowledge generated during this pilot study will help confirm the therapeutic potential of allopregnanolone agonists and provide robust data to pursue our research further to find efficient drugs. Moreover, new students will be trained to develop a strong expertise in pharmaceutical sciences related to Parkinson's disease to contribute to the efforts to develop new therapies in the field of Parkinson's disease. Our ultimate aim is to begin a clinical trial to assess the potential of our drug candidates.

Future Research Goals: My ultimate goal is to develop new drugs to slow down significant Parkinson's disease progression in patients. For this purpose, we test various therapeutic strategies, ranging from drug repurposal (dutasteride, raloxifene, zuranolone) to nutraceutical approaches (docosahexaenoic acid diets, plasmalogen precursors, trehalose rich diets). Besides, our research focuses on both translational and fundamental aspects of Parkinson's disease, such as the microbiota-gut-brain axis alterations in Parkinson's disease. Understanding the etiopathogenesis of the disease is critical to develop new therapies.

Dr. Daryl Wile

University of British Columbia

Exercise snacks for people with Parkinson disease: A pilot randomized controlled trial

Judi Richardson Pilot Project Grant funded in partnership with the Parkinson Society of British Columbia - $74,100 over one year

Parkinson Society British Columbia

Main Takeaway: This project aims to evaluate patient use of "exercise snacks" - brief (1-3 minute) bouts of exercise that can help individuals with managing motor symptoms without requiring access to exercise facilities or other prolonged exercise programs.

Project Description: We want to make it easier for people with Parkinson Disease to get active in short "exercise snacks" - these are brief (1-3 minute) bouts of vigorous exercise. We think this approach will help people who have unpredictable motor symptoms, lack of access to exercise facilities or other reasons they are unable to do follow more prolonged exercise programs. We are testing if people with PD can stick to a program of exercise snacks, and if they have better walking ability, Parkinson's severity, and quality of life. We are comparing this approach to lower-intensity "movement breaks" delivered in a similar way for 12 weeks. If it works, and if people with PD can keep up with the exercise snacks, we want to use what we learn from this pilot study for a larger, multicenter trial of this type of exercise.

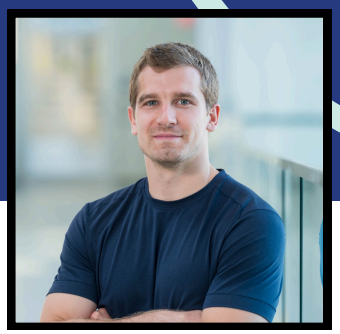
Importance of Funding: We have a team that is experienced in providing this approach of "exercise snacks" in other populations like people with heart disease, diabetes, and obesity, and pairing up their expertise with our population of people with PD and our knowledge of PD will bring new options for exercise to people with PD – we think this can get many more people active and exercising. Without this support, it would be hard to get this research partnership off the ground. We now have a way to launch this partnership with this initial pilot project and grow this to a larger project that can impact many more people.

Future Research Goals: My goal is to create tools that empower people with PD to live well, understand their illness better and feel like they have an impact on their illness progression. Part of this is about tools for better understanding symptoms, part is improving systems of care that make access and support easier for patients, and part is learning how we can tailor our advice for medications, exercise, and other treatments based on how well we get to know our patients.

Postdoctoral Research Fellowships

Dr. Connor Bevington

University of British Columbia



Effect of exercise on brain energetics in PD

Funded in partnership with the Parkinson Society of British Columbia
$90,000 over two years

Main Takeaway: My project aims to fill a knowledge gap in how brain function changes over the course of Parkinson's progression and how exercise can also target these brain functions, so that we have a clearer understanding of the effect of exercise on Parkinson's disease.

Project Description: Most people living with Parkinson's have been advised to become more physically active. Indeed, clinical research has shown that exercise is one of the best ways to manage Parkinson's symptoms and slow down disease progression. Brain imaging has shown that specific changes to brain function occur as the disease progresses, so exercise must also interact with these disease-related changes in some way. However, the specific details of this interaction—including which aspects of brain function are most targeted by exercise and how exercise-induced changes compare to disease-related changes—remain poorly understood. My project aims to fill this knowledge gap so that we have a clearer understanding of the effect of exercise on Parkinson's disease.

Importance of Funding: Parkinson's disease is complex, which has made a cure elusive and treatments/interventions that work for all people living with Parkinson's difficult to uncover. As a result, Parkinson's research is time-consuming and expensive—but worthwhile. I am incredibly grateful to those who have funded this research grant. Our research centre has the tools and expertise to put this funding to good use. Your generosity will directly help improve our understanding of how exercise impacts brain health in Parkinson's, which may help design patient-specific exercise plans to those living with the disease and/or aid in the development of future therapies.

Future Research Goals: I hope that the funding of this pilot study enables future exercise studies in Parkinson's disease and provides a framework for investigating the effect of therapeutic interventions on the brain using imaging. In ten years' time, I hope to be involved in such projects—both on the research front and in more of a leadership role—using the knowledge and expertise gained from this project to continue to progress Parkinson's disease research. Significant advances in brain scanning technology are likely to be made in a decade, so I aim to take advantage of these improvements in my research as they become available.

Dr. Tiffany Carther-Krone

University of Manitoba

Bilateral prefrontal non-invasive brain stimulation to improve cognition in Parkinson's disease

Funding generously provided by an anonymous donor
$90,000 over two years

Main Takeaway: In the proposed study, we will test the effect of daily high definition transcranial stimulation treatment on cognitive functioning in PD patients. If successful, this study will provide a novel, effective treatment strategy for cognitive impairment in PD, which could be used as a safe, non-medication-based alternative, or combined with other therapeutic approaches as they become available.

Project Description: Recently, a non-invasive brain stimulation technique called transcranial direct current stimulation (tDCS) has become a popular approach to improve cognitive impairment in people with PD. However, studies have mainly focused on stimulation involving a single brain region due to constraints of tDCS technology. The recent introduction of high-definition tDCS (HD-tDCS) also allows for multiple brain regions to be stimulated simultaneously. We hypothesize that PD-related cognitive deficits can stem from brain circuit dysfunction and can be restored by resetting the abnormal brain circuits via tDCS. We expect that stimulating a brain region called the dorsolateral prefrontal cortex, responsible for cognitive functioning, will improve PD-related cognitive dysfunction.

Importance of Funding: By funding this project, donors are helping to pioneer non-invasive, non-pharmacological interventions for cognitive impairment in PD, which is particularly important considering the current treatment options are limited and many rely on medications, which can have various side effects. HD-tDCS offers a promising alternative or complement to existing therapies, providing a safer and potentially more effective approach. Also, cognitive impairment in PD is an area that has not received as much attention as motor symptoms. This funding provides an opportunity to bridge this gap by focusing on cognitive functions, ensuring that all aspects of PD are addressed and providing a comprehensive understanding of the disease and its impact on patients.

Future Research Goals: I envision myself continuing to make meaningful contributions in the field of cognitive impairment in Parkinson's disease (PD), dedicated to advancing research and translating findings into tangible improvements in patient care. As an established researcher, I hope to focus on bridging the gap between bench discoveries and bedside interventions, focusing specifically on the development of novel therapeutic strategies that directly target cognitive impairment, ultimately enhancing the quality of life for individuals living with PD.

Dr. Tiffany Kolesar

University of Manitoba

Identifying the motor, cognitive, and neural basis of a dual-task cognitive game-based treadmill training intervention in Parkinson's disease

$90,000 over two years

Main Takeaway: This project aims to look at the impact of a treadmill-based dual-tasking exercise on brain function and if it can improve gait and cognitive impairments in Parkinson's.

Project Description: We recently developed a dual-task (DT) treatment during which people with PD walk on a treadmill while playing cognitively challenging videogames. Our early results show that while this intervention is challenging, it shows great promise for improving gait and cognitive impairments in PD. However; so far, we do not know how this DT treatment impacts brain function—this information is important for understanding how gait and cognition improve. We will compare the patients with PD who went through the DT program to those who just walked on the treadmill. We will compare both of these PD groups to the healthy controls as well. We will see if there are any brain changes between the two PD groups to see if the treatment improved their brain function or structure.

Importance of Funding: I am so grateful to the donors who have funded my award! This funding opportunity has allowed me to continue this important research. While this study has been ongoing for a few years, our progress was drastically limited by COVID in its early days. This funding has allowed me to remain on the project until completion, and allows me the opportunity to analyze, interpret, and publish the data so that this important work can be shared with the community as soon as possible. Importantly, being awarded this funding will improve my likelihood for success as a future independent researcher, as it will help me to establish a track record of successful funding applications.

Future Research Goals: In the future, I see myself having my own research lab to lead studies investigating neurodegenerative diseases such as Parkinson's, using a variety of neuroimaging methods. I will aim to have a balance of basic science research, as well as clinical research, in order to pave the way for future treatments, as well as to evaluate and improve current treatment options. This current funding opportunity will aid me in acquiring future funding to conduct my own research studies—a vital component to furthering research. This funding opportunity will further increase my likelihood for success once I start my own research lab as well.

Dr. Margaux Teil

McGill University

Development and analysis of a marmoset model of Parkinson's disease

$90,000 over two years

Main Takeaway: This project looks to develop a primate-based animal model of Parkinson's disease to better understand the biological processes underlying the condition both symptomatically and at the cellular level.

Project Description: No existing experimental model has yet reproduced all aspects that we observe in human Parkinson's disease patients, including disease manifestations and changes in the brain at the cellular level. In my project, I aim to develop a primate experimental model of Parkinson's disease, based on the injection of alpha-synuclein in the brain of animals. Following intra-cerebral injections of alpha-synuclein, we will monitor the behaviour of the animals monthly, in search for signs of changes in motor function. We will then investigate changes that occur in the brain after injection, to determine if our experimental model accurately replicates features of the human disease. We will then seek to discover if animals from our experimental model show changes within the make-up of their brain cells. This last series of experiments will provide critical insight into the processes contributing to Parkinson's disease and will bring us one step forward in our search for strategies to diagnose the disease earlier, and ultimately to develop novel therapies that could cure the disease.

Importance of Funding: This fellowship award is of crucial importance to me and my team leaders. It will ensure the financial support of this project and enable it to move forward considerably in the next few years. Importantly, this grant will also give me the opportunity to present my work and collaborate with other researchers in the Parkinson's disease field at international conferences. Finally, this funding will open doors for me to pursue my research in my future endeavors to work on Parkinson's disease and its causes, with the ultimate hope of making a real impact in patients' lives in the future.

Future Research Goals: In the future, I expect to have progressed in my knowledge of the mechanisms behind the development of Parkinson's disease by being an active scientist in the search for ways to diagnose patients earlier, help slow down the progression of this disease, and contribute to finding a cure. I hope to run my own team and to have the possibility to mentor and train younger researchers, as well as the opportunity to work with other scientists to find answers in the field of neurodegenerative diseases.

Dr. Chun Yao

Université de Montréal

Predicting iRBD phenoconversion to synucleipathies with REM sleep advanced EEG analysis

Funding generously provided by Dick and Val Bradshaw
$90,000 over two years

Main Takeaway: In this project, we aim to evaluate changes in nocturnal brain signals in patients with idiopathic REM sleep behavior disorder (iRBD), specifically exploring potential biomarkers available in two different REM sleep substages. Our goal is ultimately to develop new tools for clinicians and researchers based on these biomarkers.

Project Description: RBD is known to affect many patients with Parkinsonism. When occurring before disease-onset, studies show that most patients with idiopathic RBD would eventually develop dementia with Lewy bodies (DLB) or Parkinson's disease (PD) in 5-15 years. Studying iRBD progression gives rise to efforts in designing neuroprotective trials, and understanding the progression from iRBD to DLB or PD is essential for developing treatment trials. Our project will evaluate changes in nocturnal brain signals in patients with iRBD during REM sleep, specifically biomarkers available during the two distinct neurophysiological substages that occur during REM sleep. In addition, since neurons communicate with each other at a very fast speed, we will examine the potential changes in these "microscopic" brain activities in patients with iRBD. Ultimately, our goal is to develop new tools for clinicians and researchers based on these potential biomarkers to be found in our study.

Importance of Funding: With the donors' generosity and the support of the Parkinson Canada Foundation, this funded project will allow us to further our research into potential neurophysiological markers embedded in REM sleep. The prospective advancement in our understanding of the patients' REM sleep brain activities will allow us to explore more complex pathoneurophysiological patterns on the time scale. Ultimately, we hope that our findings will contribute to the development of treatment and an improved healthcare strategy for patients.

Future Research Goals: The primary impact expected of our study is the prediction of future Parkinsonism diagnosis for at-risk individuals with iRBD. As such our findings of potential biomarkers can contribute to the development of neuroprotective trials, which will aim to slow down disease progression. My end goal is to become a clinician researchers, and this work will allow me to continue doing research while providing care to patients along their journey of living with Parkinsonism.

Graduate Student Awards

Ms. Héloïse Baglione

Université Laval

A new treatment approach to rehabilitate affective prosody comprehension deficits

$40,000 over two years

Main Takeaway: The goal of this project is to develop an innovative speech therapy treatment to reinstate the lost ability to understand vocal emotions within people living with PD to ultimately improve the quality of life as this type of treatment is currently nonexistent in Quebec.

Project Description: Parkinson's disease is well known for being a neurodegenerative disorder attacking motor skills, including difficulties in communication and issues recognizing verbal content or facial expressions. Current speech therapy treatments are not as advanced as they should be to handle these types of deficits as it's focused primarily on treating the symptoms rather than treating the underlying issue. Our main goals are to develop a treatment in the French speaking part of Quebec to rehabilitate the ability to understand vocal emotions and test it on patients affected by PD. We would then determine the effectiveness of the treatment in said individuals through post treatment rehab.

Importance of Funding: We are extremely grateful for your generous support as I know it encourages me to focus further on my research studies and to advance the research in the field of Parkinson's. As a speech therapist and doctoral student, I'm intrigued in the cognitive processes related to PD which is what motivates me to develop a new approach to rehabilitate the understanding of vocal emotions within PD patients. Especially as emotions play an important role in human relationships, this project benefits not only patients but also the public.

Future Research Goals: By the end of the grant, I hope to have aided in the establishment of a speech therapy treatment aimed to rehabilitate deficits in the understanding of vocal emotions as these types of treatments are currently nonexistent in the French speaking part of Quebec. I also hope to aid individuals living with PD who wish to improve their social communication by enhancing their ability to understand vocal emotions. I'm focused mainly on improving the quality of life for people living with deficits in communication due to PD. In ten years, I see myself to have developed teaching skills in order to share discoveries with students.

Ms. Julie Bouquety

Université de Montréal

Investigation of the role of Parkin in the context of idiopathic Parkinson's disease and aging using induced neurons

$40,000 over two years

Main Takeaway: This project aims to study the influence of aging on function of the protein Parkin and whether this could contribute to dopaminergic cell death. This has potential to provide a new therapeutic target for patients with idiopathic forms of PD.

Project Description: This project is studying the contribution of the protein Parkin, involved in a familial form of PD, to the idiopathic form of the disease. Given that idiopathic PD is an age-related disorder, we hypothesize that the cellular alterations associated with ageing such as increased oxidative stress and inflammation cause structural alterations in Parkin and as such, that Parkin is also involved in idiopathic forms of PD. Consequently, the goal of this project is to study the influence of aging on Parkin function and whether this could contribute to dopaminergic cell death. Using a method we have recently developed; we will generate dopamine neurons from skin cells collected from patients or healthy donors. This method has the advantage to preserve the age signature and allows us to study the disease in a model derived from idiopathic PD patients that will display the specificity of aged dopamine neurons.

Importance of Funding: The support of scientific and philanthropic organizations is essential to me because it gives me a conducive environment to achieve a work that, I strongly believe, will provide new insights into the field of Parkinson Disease. In conjunction with my counterparts work all over the Parkinson Disease network, this project will help to move forward the knowledge we have on the disease, and hopefully at some point in the future, bring relief to the patients, which will be my greatest joy and pride.

Future Research Goals: I am convinced that my project will give insight into how aging influences the development or evolution of PD, an aspect that is still unclear today. I hope that, in the future, it ultimately would help determine more precisely what actions can be taken to reduce the risk of developing the disease, to anticipate the development of the disease, or even to help improve the quality of life of PD patients. In addition, being able to maintain the age signature in neurons that are being studied will allow us to observe age-associated traits that are a fundamental part of Parkinson's disease, and better guide future research into the progression and development of idiopathic Parkinson's.

Ms. Medhinee Malvankar

McGill University

Early biomarker development and therapeutic impact investigation

$40,000 over two years

Main Takeaway: This project aims to repurpose an existing drug to target and reduce the misfolding and aggregation of the protein alpha-synuclein. This could lead to a smaller burden of Lewy bodies and, in turn, slower disease progression.

Project Description: In Parkinson's disease (PD), the protein alpha-synuclein can misfold and start to aggregate into Lewy bodies. It is difficult to design therapeutics to target these Lewy bodies because they are dense with misfolded proteins. However, targeting the initial misfolding of alpha-synuclein is a promising avenue of research worthy of further exploration. In healthy people, the protein Hsp90 targets misfolded alpha-synuclein to prevent it from spreading throughout the brain and turning into a Lewy body, but in PD (and aging in general) Hsp90 does not function as well. Our research aims to promote the functioning of Hsp90 through the use of a drug called PU-AD to enable more clearance of misfolded alpha-synuclein and a decreased burden of Lewy bodies. Importantly, PU-AD is already in clinical trials for Alzheimer's disease and Amyotrophic Lateral Sclerosis (ALS), therefore our research will be focused on repurposing this for PD. In turn, we hypothesize this will improve disease outcomes and lead to a better therapeutic strategy for people with PD.

Importance of Funding: The generous support in funding is crucial for the success and advancement of our study. Not only does it alleviate financial pressures, it also allows us to use cutting-edge techniques for cognitive testing and non-invasive MRI for neuroimaging. These tools help us translate information from mice to humans, improving the quality of clinical trials. Additionally, I have first-hand experience of the impacts of PD, so this funding supports my personal goal of finding effective treatments and improving quality of life.

Future Research Goals: I am driven to study Parkinson's due to my fascination with the complexities of neurodegenerative diseases. My aspiration is to advance my research and, in ten years, become a leading researcher in this field. I aim to develop a comprehensive research program that not only enhances our understanding of these diseases but also translates this knowledge into more effective treatments. I aim to collaborate with academic and industry partners, as well as actively participate in the scientific community through conferences and publications. Ultimately, my goal is to improve the quality of life for people affected by neurodegenerative diseases such as PD.

Ms. Tara Shomali

McGill University

Development of chemical probes targeting PINK1 to study Parkinson's disease

Funding generously provided by the Leacross Foundation
$40,000 over two years

Main Takeaway: The goal of this project is to optimize a candidate drug to target the PINK1 protein in Parkinson's disease (PD). Additionally, we will work to isolate the protein to garner a better understanding of how PINK1 becomes dysfunctional in disease. Together, this project aims to improve the treatment options available to those with PD.

Project Description: This project focuses on the development of a treatment for PD targeting the protein PINK1, which can be dysfunctional in disease. In a healthy state, PINK1 alerts the cells of any problems with the mitochondria. In disease, PINK1 becomes overactivated leading to a degradation of healthy mitochondria, further contributing to disease. Our group has previously identified a compound targeting PINK1 to reduce its activity, however it is not specific to PINK1 and can unintentionally bind to other proteins. The goal of this research is to optimize the binding of this compound so that it can be specific to PINK1, thereby enabling specific inhibition of PINK1 for future research and therapeutic benefit. Our group also aims to isolate the human PINK1 protein, a feat that remains difficult due to the nature of the PINK1 protein. However, by isolating human PINK1 protein, we can design new drugs that will expand the treatment options for those with PD.

Importance of Funding: Our project benefits from Parkinson Canada funding to aid in the advancement of our research by enabling me to dedicate additional time and resources to explore new innovative approaches to PD treatment. With this added support, we could deepen our understanding of PINK1's role in the severity of this disease which would bring me closer to my goal of creating effective therapies that would improve the lives of people affected by PD.

Future Research Goals: By the end of the grant, our hope is to have better understand the PINK1 protein which would help determine some of the underlying relations it has to PD. Our future research goals include developing new tools and drugs to study PINK1, to hopefully control the activity of the protein and slow or halt disease progression. This will expand our understanding of PD and has the potential to significantly improve the quality of life of people affected by PD. In ten years, I see myself as a lead researcher in the field of neurodegenerative diseases, where I hope to run my own research lab and continue innovative and cutting-edge techniques to treat a range of different conditions.

Ms. Emma Somerville

McGill University

The effect of genetics and biomarkers on the risk and progression of REM-Sleep Behaviour Disorder (RBD)

$40,000 over two years

Main Takeaway: This project aims to uncover the relationship between REM sleep behavior disorder and Parkinson's disease to develop treatments that aid in the prevention and progression of the disease. This has potential to help create a better quality of life for the patient with a vision to improve early detection, treatment, and patient outcomes.

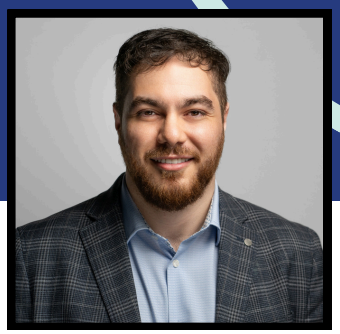
Project Description: This project investigates the connection between REM sleep behaviour disorder (RBD; acting out one's dream during REM sleep) and Parkinson's disease (PD). RBD is a prodromal symptom of PD, meaning that it can occur several years before diagnosis with PD. This project aims to better understand the genetic component of RBD in hopes of connecting this to biomarkers of RBD and its progression to PD. Ultimately, this will lead to a more comprehensive understanding of RBD and could provide clues to the underlying progression of PD and related synucleinopathies.

Importance of Funding: The funding provided by Parkinson Canada is vital to our research, especially after witnessing firsthand the extreme impact PD has on individuals and their families. The support allows me to dedicate my full attention to advancing our studies, without the distraction of financial constraints. By alleviating these financial pressures, we are better positioned to explore therapies that could potentially prevent PD in individuals who exhibit RBD symptoms. This support not only accelerates our work but also brings us closer to our ultimate goal of finding effective interventions that could alter the course of Parkinson's disease for those affected.

Future Research Goals: Finding patients diagnosed with RBD is challenging, making our lab one of the few globally that specialize in this disorder. Our study aims to be one of the first groundbreaking insights in identifying genetic markers associated with RBD, which could greatly aid clinical trials. We hope our research will significantly advance the neuroprotection for PD patients and improve therapies for those at risk of developing PD. In the following years, I plan to continue this research and, as a professor, focus on early detection of the disease. Moreover, I aim to contribute to clinical trials and aid in the creation of new medications. Ultimately, I envision working with nonprofits to connect PD patients, donors, and scientists, creating a unity best to find effective treatments.

Mr. Alaa Taha

Western University



Mapping the subcortical connectome in Parkinson's disease patients undergoing deep brain stimulation

$40,000 over two years

Main Takeaway: This project will utilize MRI to identify surgical targets for deep brain stimulation (DBS), as well as better understanding the ways in which brain regions associated with Parkinson's are connected and how those regions differ between patients receiving DBS and health controls.

Project Description: Our work aims to advance our understanding of DBS by leveraging high resolution brain imaging. Our approach relates surgical targets to important brain landmarks which we can find on lower quality scans, combining neuroanatomy and AI tools to develop a precise surgical planning tool. Our aim is to analyze data from participants receiving DBS for PD alongside data from healthy controls. This comparison will help us understand PD-induced brain structure changes and adapt our approach during DBS surgery. We also plan to examine the short brain connections near DBS surgical targets using data from MRI. Through comparing these brain connections in healthy and PD states while linking them to the position of DBS electrodes and clinical outcomes, we aim to elucidate how DBS contributes to treatment.

Importance of Funding: This funding enables us to pursue innovative solutions for improving the lives of individuals battling PD. This funding is crucial for advancing our research, which aims to enhance the precision and effectiveness of DBS — a transformative option for PD patients. The grant allows us to continue using cutting-edge technologies, like the 7-Tesla MRI, and develop AI-driven tools to better understand and target affected brain regions.

Future Research Goals: For individuals affected by PD, this research offers numerous benefits and potential future research targets. Opening the door to personalized DBS treatments based on individual brain circuitry variations can potentially eliminate extensive and tiring programming sessions. Additionally, by utilizing cutting-edge AI and neuroimaging techniques, we're not only addressing current DBS therapy challenges but also laying groundwork for future innovations. Our millimetric tools and software could also be applied to other non-invasive neuromodulation therapies, expanding treatment options for PD. In the future, I hope to focus on the development and implementation of innovative, AI-driven approaches to enhance diagnostic and therapeutic strategies for neurological disorders. I aspire to work in a collaborative and interdisciplinary environment to bridge the gap between scientific discoveries and clinical practice.

New Investigator Awards

Dr. Aurélie de Rus Jacquet

Université Laval

Alpha-synuclein at the brain vasculature: A new disease mechanism and drug target

$135,000 over three years

Main Takeaway: We hypothesize that alpha-synuclein aggregates found in the blood of people with Parkinson's disease weaken the protective blood-brain barrier and induce neurodegeneration. To address these questions, we established a cellular model of the blood-brain barrier to study the interactions between alpha-synuclein, the brain vasculature, and neurons.

Project Description: Our model uses the technology of induced pluripotent stem cells, which enables the production of all cell types involved in blood-brain interactions. For this project, the blood-brain barrier model will consist of induced pluripotent stem cells derived from Parkinson's disease donors or controls. Then, alpha-synuclein aggregates will be isolated and amplified from the serum of people with Parkinson's disease enrolled in the Canadian Open Parkinson Network program in order to produce pathological seeds that we can use in the in vitro model. Next, alpha-synuclein aggregates will be perfused in the blood vessel (i.e. vascular compartment) of the model, and we will measure changes to neuron viability and neuroinflammation (in the brain compartment), as well as changes to vascular function. Data collected in these experiments will be correlated to each donor's clinical and demographic information in order to identify determinants of alpha-synuclein toxicity, to shed light on an understudied aspect of Parkinson's disease pathology with potential to identify new disease targets and biomarkers.

Importance of Funding: This New Investigator Award is incredibly precious, as it supports the very beginning of my independent career as a Parkinson's disease researcher. This funding will be essential to establish my laboratory, accelerate important projects directly aimed at supporting drug discovery efforts, but also train the next generation of Parkinson's disease scientists. I am very grateful to the donors, their generosity will make a difference in our fight against the disease.

Future Research Goals: I hope that my research and my trainees will contribute to our community's common goal to end Parkinson's disease. The strength of my laboratory is the use of human cellular models to investigate disease mechanisms, and a central objective is to provide meaningful data to clinicians and drug developers to advance therapeutic molecules to the clinic.

Dr. Stefan Lang

University of British Columbia

Network signatures of non-motor symptom outcomes following Deep Brain Stimulation in Parkinson's disease

Funded in partnership with the Parkinson Society of British Columbia
$132,000 over three years

Parkinson Society British Columbia

Main Takeaway: This project aims to identify a very specific pattern of brain circuit engagement that is predictive of good non-movement outcomes in deep-brain stimulation (DBS). By identifying this specific network signature, we can optimize DBS treatment and ultimately develop new therapies for the emotional and cognitive issues present in Parkinson's disease.

Project Description: Parkinson's disease is a common condition that not only affects how people move but also impacts their emotions and thinking abilities. While we have treatments to help with movement issues, treating emotional and cognitive problems remains challenging. These 'non-motor symptoms' can significantly impact quality of life and have no effective treatments. We're focusing on a technique called Deep Brain Stimulation (DBS), whereby an electrode is placed deep in the brain to treat a dysfunctional brain circuit. This common therapy helps with movement but has inconsistent results for non-movement issues. First, we plan to comprehensively document how DBS affects non-movement symptoms. Then, we plan to gain insight into this variability by assessing the relationship between the position of the electrode and specific brain circuits.

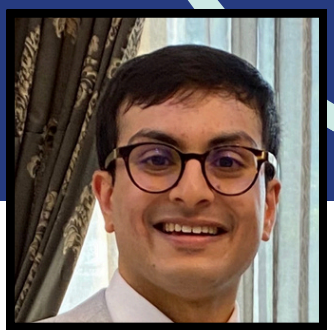
Importance of Funding: My research would not be possible without funding from the Parkinson Canada New Investigator Grant. This type of funding is critical for early career researchers. With this funding, I will be able to hire a research assistant and build a clinical database of non-motor outcomes following DBS. Hopefully this grant will allow us to gather promising data that will facilitate even more investment into Parkinson's research from other granting agencies such as the CIHR.

Future Research Goals: We believe this research will advance the field of deep brain stimulation. This will allow us to improve the safety of the surgery and will allow us to better inform people who are considering the procedure about the risks and benefits. In the future, we hope to develop new therapies for the non-motor symptoms of Parkinson's disease. This research will be an early step in that direction. I hope my research will ultimately improve the treatment of non-motor symptoms of Parkinson's disease. This means improving existing therapies such as deep brain stimulation, but also contributing to non-invasive neuromodulation strategies that may more easily accessible to a wider range of people.

Clinician-Scientist Research Fellowship

Dr. Arjun Balachandar

University of Toronto



Adaptive neuromodulation using electrocorticography and deep brain stimulation to treat freezing of gait in Parkinson's disease

$150,000 over two years

Main Takeaway: We aim to design a new deep brain stimulation (DBS) system that can detect FOG episodes from brain activity alone, and then specifically treat them either before they occur or as they happen by changing the level of DBS stimulation.

Project Description: Difficulties with walking can have a significant impact on the quality of life of people with Parkinson's disease (PD). One of the most serious is freezing of gait (FOG), which are brief but severe episodes of inability to walk. Studies have shown that "electrocorticography" (ECoG) electrodes can detect specific abnormal brain signals that happen during FOG. We aim to design a new deep brain stimulation (DBS) system that can detect FOG episodes from brain activity alone, and then specifically treat them either before they occur or as they happen by changing the level of DBS stimulation during the study. We will use ECoG to record brain activity while patients perform treadmill-based tasks. While patients walk on the treadmill and experience FOG episodes, we'll measure the brain activity and see if that recording can predict if a patient is about to have or is experiencing FOG. We'll either decrease or increase DBS stimulation level by a certain percentage and repeat the experiments with different levels of increase/decrease in stimulation to see which changes best stop FOG.

Importance of Funding: I am so grateful for the support of all the wonderful donors and to Parkinson Canada as a whole for supporting important research in Parkinson's disease. We are making major advances in our knowledge of the pathogenesis of the disease, and donors and the Parkinson Canada organization I believe play a major role in pushing further discoveries and innovations for better treatments. Their support is especially crucial in supporting my research goals in developing novel neuromodulation treatments, which I hope will eventually be helpful to people with PD.

Future Research Goals: My goal is to become a clinician-scientist developing new brain stimulation treatments accessible to Canadians to treat PD and related neurodegenerative conditions. My short-term goal is to develop smarter adaptive methods of neurostimulation for various undertreated facets of PD such as freezing of gait and sleep disorders that are debilitating but sometimes even worsened by conventional DBS. I hope to use novel technology such as electrocorticography cortical arrays (ECoG) to decode behavioural states to guide such adaptive neurostimulation to potentially reduce the burden of these symptoms.

Clinical Movement Disorders Fellowships

Dr. Yasamin Mahjoub

University of Toronto

Clinical Movement Disorders Fellowship

$75,000 over one year