



CANADA FOUNDATION FOR INNOVATION 15-8
Innovation Fund
Notice of Intent

1. Completed NOIs must be submitted by the Associate Dean (Research)/Research Liaison Officer of the “Lead” Unit to the Office of Research Services to: Birtukan.Gebretsadik@umanitoba.ca by May 15, 2018.

Proposed name of project: NEURODEGENERATIVE BRAIN DISEASES: EARLY DIAGNOSIS THROUGH THE EYE AND IMMEDIATE EFFECT OF INTERVENTION	Estimated Total Project Costs: \$1,000,000												
Designated Project Leader/Faculty/Dept: Behzad Manssouri/Rady Faculty of Health Sciences/Department of Internal Medicine/Section of Neurology													
List Principal Users/Faculty/Dept: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">1. Dr. Zahra Moussavi/Electrical Engineering/Biomedical Engineering</td> <td style="width: 20%; text-align: right;">CV: <input checked="" type="checkbox"/></td> </tr> <tr> <td>2. Prof. Brian Lithgow/Electrical Engineering/Biomedical Engineering</td> <td style="text-align: right;">CV: <input checked="" type="checkbox"/></td> </tr> <tr> <td>3. Dr. Marco Essig/Rady Faculty of Health Sciences/Department of Radiology</td> <td style="text-align: right;">CV: <input type="checkbox"/></td> </tr> <tr> <td>4. Dr. Guillermo Rocha/Rady Faculty of Health Sciences/Department of Ophthalmology</td> <td style="text-align: right;">CV: <input checked="" type="checkbox"/></td> </tr> <tr> <td>5. Dr. Stephen Brodovsky/Rady Faculty of Health Sciences/Department of Ophthalmology</td> <td style="text-align: right;">CV: <input checked="" type="checkbox"/></td> </tr> <tr> <td>6. Dr. Chase Figley/Electrical Engineering/Biomedical Engineering</td> <td style="text-align: right;">CV: <input type="checkbox"/></td> </tr> </table>		1. Dr. Zahra Moussavi/Electrical Engineering/Biomedical Engineering	CV: <input checked="" type="checkbox"/>	2. Prof. Brian Lithgow/Electrical Engineering/Biomedical Engineering	CV: <input checked="" type="checkbox"/>	3. Dr. Marco Essig/Rady Faculty of Health Sciences/Department of Radiology	CV: <input type="checkbox"/>	4. Dr. Guillermo Rocha/Rady Faculty of Health Sciences/Department of Ophthalmology	CV: <input checked="" type="checkbox"/>	5. Dr. Stephen Brodovsky/Rady Faculty of Health Sciences/Department of Ophthalmology	CV: <input checked="" type="checkbox"/>	6. Dr. Chase Figley/Electrical Engineering/Biomedical Engineering	CV: <input type="checkbox"/>
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‘Lead’ Unit ADR/RLO: Name: Dr. Peter Nickerson													

Briefly describe (max 1 page, 12 pt. font size, 2 cm margins):

- The proposed research and how it is world-class, innovative and demonstrates clear benefits to Canada.
- The infrastructure and how it will enhance the University’s existing research capacity.
- The excellence of the team, including expertise and existing collaborations necessary to conduct the proposed research.
- Plans to secure matching funds and the potential funding sources for the operation and maintenance of the infrastructure.

The goal of this study is early diagnosis of dementia by monitoring the immediate effect of treatment on visual function using functional magnetic resonance imaging (fMRI). “The Eye Is Our Window To The Brain”. This statement has been used for decades in popular media representing an intuitive significance of understanding eyes changes as an indicator of the brain status. This belief stems from the eyes being extensions of the brain together with the nerves in the back of the eyes are visible with an ophthalmoscope. Recent studies have shone light on the detailed eye and brain connectivity. It has been shown that many brain conditions such as dementia impact the eyes before any meaningful changes can be captured in the brain with current diagnostic devices. One major advantage of studying brain condition through the eyes is that analysis of the eyes with advanced imaging can provide invaluable information about its functional and metabolic state, i.e. confocal microscopy of the cornea and ocular tomography of the retina have enabled us to objectively measure the density of nerves in the cornea and the thickness of various neuronal layers of the retina and optic nerve. Preliminary evidence indicates the loss of nervous integrity either in the cornea or in the retina/optic nerve correlates with early stages of dementia. We aim to validate and expand these findings in connection with other objective findings i.e. EvestG. This research is cutting edge at the international level.

Significance to Canada: Dementia affects millions of Canadians thus is a growing public concern and health system burden. Early diagnosis leads to more effective treatments and cut the costs/burden.

Existing research capacity: Recent studies suggest that activating the brain neurons with Repetitive Transcranial Magnetic Stimulation (rTMS) may prevent or delay dementia. Dr. Moussavi from University of Manitoba was granted a CFI funding that provided the infrastructure to carefully examine the effect of rTMS in dementia. This project has attracted several fundings including \$1.6M from the Weston Brain Institute for a multisite placebo controlled study of rTMS. University of Manitoba is one of the worlds main centers of research in rTMS and dementia. Additionally Electrovestibulography (EvestG) research under the leadership of Prof. Lithgow has been shown to be useful in early diagnosis of dementia and dementia type.

Research proposal: The aims of this proposal are: (1) Early diagnosis of dementia- With a confocal corneal microscope and ocular coherence tomography machines, we will collect information that will be used along with the current EvestG information and standard questionnaires (e.g. ADAS-cog) for early diagnosis of dementia. (2) Treatment of dementia and studying its immediate effect on the brain. The physical distance between the fMRI and rTMS facilities have prevented studying the immediate effect of the rTMS treatment. The NRC fMRI facility in Winnipeg can provide a space beside the MRI room to accommodate the requested fMRI and rTMS machines. We would like to obtain an rTMS machine, brain navigation system, and prepare that space for accommodating the rTMS machine e.g. insulation and updating the electrical wiring.

Excellence of the team: The PI is one of the two neuro-ophthalmologists in Manitoba and has researched brain-eye diseases for over a decade. Dr. Moussavi and the PI have collaborated over the past two years, in the above mentioned multisite placebo controlled international clinical trial in rTMS treatment for Alzheimer’s disease. The team also collaborates with nationally recognized ophthalmologist in the field of cornea, Dr. Rocha and Dr. Brodovsky. Dr. Lithgow is the inventor of EvestG and will collaborate in this research. Dr. Essig is an fMRI and rTMS expert and the head of radiology department. He has been in charge of the imaging facilities in Manitoba; the funded CFI lab provides the state of the art technology in fMRI. Dr. Figley is an fMRI expert. The collaborators carry different but complementary expertise that guaranties the success of the project.

Future fundings: The infrastructure that we will build with this CFI funding will be used to apply for local and national fundings for further research and clinical trials in dementia. Given that the early diagnosis and treatment of dementia has been a research priority in Canada, we are certain that we will be successful in securing future funding.