



Djavad Mowafaghian CENTRE FOR BRAIN HEALTH

2015/2016 Year in Review

ADVANCING BRAIN HEALTH THROUGH RESEARCH AND CARE









A MESSAGE FROM **DR. BRIAN MACVICAR & DR. JON STOESSL** CO-DIRECTORS OF THE DJAVAD MOWAFAGHIAN CENTRE FOR BRAIN HEALTH



THE CENTRE BY THE NUMBERS

165	clinic, administrative and research staff
148	members
120	graduate students enrolled in the Graduate Program in Neuroscience
9,000	patient and family visits
\$31	million in research funding
7	donor-funded professorships

anew era In brain health research and care

Looking back on the first two years of the Djavad Mowafaghian Centre for Brain Health (the Centre), we are immensely proud of the accomplishments of our investigators, clinicians, students, and staff. On every level of the building, researchers and clinicians have been making discoveries that provide a profound understanding of brain function, structure, and connectivity.

If our first year was about growth, our second year has been about making connections and finding opportunities to leverage our resources to collaborate across departments and disciplines.

A highlight of this collaboration has been the establishment of the Borgland Family Brain Tissue and DNA Bank (see Facility Highlights), a centralized resource for the collection, storage, and distribution of pre- and post-mortem tissue for research at the Centre. Investigators in labs and clinics, as well as staff from the University of British Columbia (UBC) and Vancouver Coastal Health (VCH), have worked together to make this important resource a reality.

Over the past year, we've welcomed distinguished guests to the Centre to share their knowledge and build relationships with our investigators, including our partners at Jiaotong University in Shanghai and Capital Medical University in Beijing. We've hosted events in our space and in the community, providing opportunities for our members and students to interact with the public and share their research in a way that creates enthusiasm and dialogue.

As we look back on our second year, and ahead to year three, our hope is that you share our sense of pride in this place, in the accomplishments of our people, and in the discoveries that will propel the future of brain health in British Columbia and beyond.

AJStoess

Dr. Brian MacVicar

Dr. Jon Stoessl

facility highlights

Borgland Family Brain Tissue and DNA Bank

In 2015, the Borgland Family Brain Tissue and DNA Bank (the Biobank) was established in the centre as a resource for the collection, storage, and distribution of the highest quality pre- and post-mortem tissue. The Biobank has the capacity to store and process thousands of biospecimens for numerous research purposes. This valuable resource will be used by investigators in the Djavad Mowafaghian Centre for Brain Health and affiliated centres, and will serve as a critical link between the clinical and research teams, allowing scientists to accelerate research progress.

A key milestone in developing the Biobank was hiring Dr. Seti Boroomand as facility manager in April 2015. Dr. Boroomand Dr. Seti Boroomand

BORGLAND FAMILY

BRAIN TISSUE AND DNA BAN

has over a decade of experience in translational research using human biospecimens and is skilled in building biobank collections. She completed her PhD in pathology and laboratory medicine at UBC and spent five years managing the cardiovascular biobank at St. Paul's Hospital.

Since joining the Centre, Dr. Boroomand has begun laying the foundation for a well-managed, accessible Biobank. She is currently preparing the governance structure, creating a business plan, and establishing a steering committee to manage this incredible asset that is poised to become an invaluable epicenter of discovery.



"The development of the Biobank is exciting for me and my colleagues at the Centre. The next step in one of our Alzheimer research projects is to look at brain autopsies to better understand the link between Alzheimer disease and damage to the small blood vessels in the brain. We could not lend our expertise to this North America-wide study without access to biospecimens in-house. This work could open the door to developing new therapies for a disease that so far has proven very difficult to treat."

- Dr. Cheryl Wellington, Professor, Pathology and Laboratory Medicine



Neuroimaging and Neurocomputation Centre

Throughout 2015, Dr. Kurt Haas and his team added substantial resources to the Neuroimaging and Neurocomputation Centre within the Djavad Mowafaghian Centre for Brain Health.

- Collaborative workspace with eight high-tech stations for data analysis, live cell imaging, and programming
- SP8 White Light Laser confocal microscope, now adopted by over a dozen labs
- 3D printer helping to make custom parts for labs
- Zeiss AxioZoom fluorescence macroscope
- Ultra-fast laser system to facilitate development
 of new microscopes
- Optical Coherence Tomography imaging system

As the centre continues to build up its resources, scientists are becoming even better positioned to make exciting discoveries. By adding enhanced workstations in the computation centre, Dr. Haas and his team hosted imaging seminars and courses related to imaging, making the centre a hub of training in this vital area.

In the advanced bioimaging centre, the team have added a number of top-of-the-line macro- and microscopes and a 3D printer—resources being accessed by researchers across the Centre. As Dr. Haas and his team continue to build up the centre's resources, scientists at the Djavad Mowafaghian Centre for Brain Health are becoming even better positioned to make exciting discoveries for years to come.



```
Dr. Kurt Haas
```



Big data for personalized care

Working directly with neurologists and clinical fellows in the UBC Hospital MS Clinic at the Centre, the MS/MRI Research Group plays an essential role in advancing the capacity of magnetic resonance imaging (MRI) to improve the lives of people with multiple sclerosis (MS). With technical development led by Dr. Roger Tam, the group's focus is quantitative image analysis, which is the measurement of the structure, content and function of the brain using MRI images.

"Our measurements range in sophistication from lesion activity and volume, which MS/MRI established as MS imaging biomarkers 30 years ago," says Dr. Tam, "to recently developed techniques for assessing subtle changes in cortical thickness and the corpus callosum."

MS symptoms can vary greatly from one patient to the next, and its disease course is unpredictable. Because of the large variability in MS symptoms and imaging features, the group draws from a large repository of MS patient data to provide the appropriate background context, and apply powerful computing tools to reveal links between disease courses and imaging patterns. "Such 'big data' methods are being developed to model many diseases, with IBM's Watson supercomputer making recent headlines for its accuracy in cancer diagnosis," says Dr. Tam. "One of our core big data initiatives is Project BraVo (short for Brain Volume), which is a national pilot project aimed at providing personalized quantitative measurements, starting with brain volume, using routinely collected clinical MRIs of individual patients to support clinical decision making."

"I have been in medical imaging for about 20 years, going back to my graduate school days in computer science, and have been working in MS research for the past 11 years," says Dr. Tam. "The most exciting aspect of my current research program is the potential benefit for the individual patient. The convergence of big data methods, advanced brain imaging, and effective therapies for certain types of MS makes this an opportune time to focus on optimizing their integration for personalized medicine."

"The convergence of big data methods, advanced brain imaging, and effective therapies for certain types of MS makes this an opportune time to focus on optimizing their integration for personalized medicine."



Dr. Roger Tam

BRIDGING THE GAP BETWEEN IMAGING RESEARCH AND PATIENT CARE IN MULTIPLE SCLEROSIS

Magnetic resonance imaging (MRI) is a powerful tool for measuring changes in the brain and spinal cord occurring with neurological disease. Recently, several advanced MRI techniques have been developed that provide measures related to myelin and axon content. Dr. Shannon Kolind, whose MS-focused research program is centred on the development and application of myelin- and axon-sensitive MRI techniques, notes that the greater sensitivity and specificity afforded by these advancements may provide critical information regarding the underlying processes occurring in neurological disease.

"The quantitative nature of these techniques may dramatically reduce the number of patients and the time period required for testing of new therapies to be successful," Dr. Kolind says.

A key component of MS is the destruction of myelin, the fatty substance that surrounds the nerve fibres (axons) of the brain and spinal cord to speed up nerve conduction. Myelin loss exposes axons to toxic inflammation, and increases energy demand for transmission, ultimately leading to irreversible cellular exhaustion and death.

"Unfortunately, conventional MRI cannot distinguish between inflammation, demyelination, remyelination, and axonal damage," says Dr. Kolind. "Our advanced MRI measures increase sensitivity to change as well as specificity to the underlying pathology."

"For example, we recently demonstrated a significant difference in myelin measurements of non-lesional tissue for MS patients on different treatment



Dr. Shannon Kolind

arms of an experimental therapy over two years, with fewer than 30 patients per treatment arm," Dr. Kolind says. "This approach has tremendous potential for clinical trials and research studies not only in MS, but countless neurological diseases."

Preliminary research has already begun demonstrating encouraging results with clinically applicable outcomes, and investigators are now applying these advanced MRI techniques in several clinical trials.

"For patients, this will mean earlier diagnosis, more focused targeting of treatment, more efficient clinical trials, and ultimately greater availability of effective therapies for those living with neurological disease or injury."



life-changing research

Diseases of the brain and nervous system have become the most pressing social and medical challenge of the 21st century, estimated to affect over 10 million Canadians (38 per cent of the total burden of disease in Canada) and costing over \$30 billion annually. Our approach is collaborative across disciplines, and we work together to better understand, diagnose, and treat diseases of the brain. Our world-renowned faculty are leaders in their fields, and are working tirelessly to enhance quality of life and improve the health of Canadians of all ages.

The following research highlights demonstrate the variety and depth of research taking place at the Centre, and the passion of the researchers in our laboratories and clinics as they explore the complexities of the brain.

Using gene-therapy to target the root cause of Huntington disease

Huntington disease is a genetic disorder but symptoms generally don't appear until later in life. Caused by a genetic mutation that produces a toxic protein called huntingtin, the disease affects the brain and gradually worsens, causing problems with coordination and movement, mental decline and psychiatric issues.



But researchers led by Dr. Blair Leavitt found that they could accurately measure the levels of mutant huntingtin protein in the brain by collecting cerebrospinal fluid from a spinal tap. The ultrasensitive test detects small amounts of the toxic protein and can be used to follow changes in brain levels of the protein over time in response to new therapies.

This study has enabled Dr. Leavitt to initiate a new clinical trial of a therapy that may help target the genetic root of the disease, bringing hope to patients with the devastating condition. Using gene-slicing therapy, this first-of-its-kind trial will test the safety of a novel gene-silencing treatment in patients and is already in the process of screening patient candidates.

"This is an important breakthrough for several promising gene silencing therapies in Huntington disease that are now moving from the bench to the bedside," said Leavitt. "We can move forward with these clinical trials and accurately measure whether our treatments are working."

Dr. Blair Leavitt found that they could accurately measure the levels of mutant huntingtin protein in the brain.

Dr. Blair Leavitt

Shining a light on one of society's most common disorders

New research finds that light therapy can treat non-seasonal depression and improve the overall wellbeing of people suffering from the disease.

"These results are very exciting because light therapy is inexpensive, easy to access and use, and comes with few side effects," said Dr. Raymond Lam. "Patients can easily use light therapy along with other treatments such as antidepressants and psychotherapy."

The research, published JAMA Psychiatry, is the first placebo-controlled trial to show that light therapy is an effective treatment for depression not brought on by seasonal affective disorder.

Lam and his colleagues followed 122 patients and evaluated whether light therapy improved the mood of patients when it was used both with and without the commonly prescribed antidepressant fluoxetine. Light therapy involved 30 minutes of exposure to a fluorescent light box soon after waking every day for eight weeks. Some study participants were given placebo pills and placebo devices instead of the real therapies. The researchers found that light therapy helped many patients and provided the most benefit to those who were also taking antidepressants.

Depression affects one in 20 people and is among the leading causes of disability worldwide. Depression can cause significant problems in family and personal relationships, work attendance and productivity, and overall quality of life. It is also associated with an increased risk of death.

According to the researchers, medications are effective for treating depression but only work in about 60 per cent of cases.



"More and more people are seeking help because there is less stigma about having depression," said Lam. "It's important to find new treatments because our current therapies don't work for everyone. Our findings should help to improve the lives of people with depression."



Patients with Parkinson disease find strength in routine exercise

Professor, neurologist, and centre co-director Dr. Jon Stoessl caught Barbara Bodel's attention when he remarked how difficult it is to find non-exercisers in Vancouver. He was introducing a new exercise study at the Pacific Parkinson's Research Centre annual update for donors and the public two years ago.

"It's an absolute no-brainer that you need to exercise," Barbara says. "I never loved exercising, but I knew I needed something to kick-start my program."

For the next three months, Barbara and two other nonexercisers with Parkinson disease met at UBC three times a week for an hour to sweat it out on stationary bikes.

A team of research assistants encouraged them to keep their pedals spinning at 60 RPMs while secretly changing the resistance setting.

This preliminary research found that a bout of cycling releases more dopamine (the neurotransmitter depleted by Parkinson disease) into the brains of patients who exercise regularly, compared to those who don't. Physical activity reduced the stiffness and slowness of movement, as well as the apathy commonly associated with Parkinson disease.

Dr. Raymond Lam

For Barbara, participating in the study improved her physical fitness and helped her feel well. These days, she works out on the stationary bike and treadmill at her local gym three times a week.

"Just the exposure to a group of people who are so dedicated inspired me," Barbara says. "Even though I knew I should be exercising, the study showed me I could do it."

The pilot study laid the groundwork for a current five-year study within the centre, funded by Parkinson patient Kurt Gagel, to determine whether exercise changes the brains of people with Parkinson disease, decreases the severity of symptoms, increases physical and mental function, improves well-being, and affects disease progression.

Researchers halt brain swelling at the source

A team of researchers has made a significant discovery in the mechanism of brain swelling, paving the way to preventative treatment for severe to fatal brain damage following stroke, head injury or cardiac arrest.

Caused by an infusion of water and sodium chloride into the brain's nerve cells, brain swelling is a gradual process that becomes life-threatening days after the injury. By identifying the mechanism behind the swelling, emergency physicians may in the future be better able to provide pre-emptive treatment, protecting the brain in the days that follow the initial trauma.



Dr. Terry Snutch (left) and Dr. Brian MacVicar (right)

The brain swells as the sodium chloride draws fluid into the nerve cells by osmosis. This swelling—known as cytotoxic edema—eventually kills brain cells.

Using a special microscope, scientists were able to watch the cascade of events that took place within individual brain cells as they swelled. They then switched off the expression of different genes and were able to pinpoint a single protein— SLC26A11—that acts as a channel for chloride to enter nerve cells. Turn off the chloride channel, and you stop the accumulation of fluid.

The team, including Dr. Terrance Snutch, Director of Translational Neuroscience at the Centre, developed several novel technological approaches to identify the cascade of events that took place within individual brain cells as they swelled.

"We've known for years that sodium chloride accumulation in neurons is responsible for brain swelling, but now we know how it's getting into nerve cells, and we have a target to stop it from happening," explains Dr. Brian MacVicar, the study's principal investigator. "This is the first time we've been able to block its entry into the nerve cells."

Severe brain swelling is life threatening because the skull, which normally protects the brain, also limits its ability to expand. With increased pressure and nowhere to go, if the brain swells down towards the brain stem, the centers that control breathing can be crushed.

Though the technique used by the researchers in the study does not work quickly enough to mitigate swelling in the case of real head trauma, the discovery has provided a target for drug development.

"This discovery is significant, because it gives us a target – now we know what we're shooting at, we just need the ammunition," says MacVicar. "That's what we're doing now: looking for a drug to inhibit the chloride channel."

By identifying the mechanism behind the swelling, emergency physicians may in the future be better able to provide preemptive treatment, protecting the brain in the days that follow the initial trauma.



Dr. Helen Tremlett

Looking to the gut for the cause of multiple sclerosis in kids

As few as five per cent of new cases of multiple sclerosis (MS) are diagnosed in children, but to better understand the disease, children may be our brightest source of hope. In December 2015, the Multiple Sclerosis Society of Canada and Multiple Sclerosis Scientific Research Foundation announced new funding that will propel research into pediatric MS and the gut microbiome's role in autoimmune and brain diseases.

"This small percentage of MS cases actually represents a critical opportunity to potentially discover what causes MS," says Dr. Helen Tremlett. Dr. Tremlett is a Canada Research Chair and the principal investigator on the gut microbiome project that recently received the funding; this study will link in with a broader Canadian Demyelinating Disease study led by The Hospital for Sick Children and Children's Hospital of Philadelphia. "Through the families, we're typically able to get a more complete health and lifestyle history, and we're closer to the onset of the disease; there is less history to sort through with kids, and we're better able to pinpoint when the disease took hold." With such excitement and possibility, enrolment in this first-of-its-kind multi-centre study has already begun. Dr. Tremlett is at the forefront of research linking MS and the gut microbiome—her collaborative work offers preliminary data in support of a link between the gut and neurodegenerative disease, specifically pediatric MS. This study will also bring together, for the first time, both the Canadian and US Pediatric MS and demyelinating disease networks.

The discoveries in the trial so far are promising, showing that while children may be the brightest source of hope for the research, the research may also provide a source of hope for these children's futures.

"This small percentage of MS cases actually represents a critical opportunity to potentially discover what causes MS."

Motherhood permanently alters the brain

Hormone therapy (HT) is prescribed to alleviate some of the symptoms of menopause in women. Menopausal women are more likely to be diagnosed with Alzheimer disease but not other forms of dementia, and HT has been prescribed to treat cognitive decline in post-menopausal women with variable degrees of effectiveness.

New research from Dr. Liisa Galea suggests the form of estrogens used in HT and that occur in motherhood could be critical to explaining why HT has variable effects.

Dr. Galea studied how two forms of estrogens, estradiol and estrone, affect neuroplasticity, which is how neural pathways in the brain change in response to various factors. Her studies focused on the hippocampus, which has important roles in memory and spatial ability.



Both forms of estrogens increased the production of new cells in a part of the hippocampus called the dentate gyrus in young female rats. However, only chronic estradiol, but not chronic estrone, significantly

Dr. Liisa Galea

increased the survival of these new neurons, and increased the expression of zif268, a protein involved in neuroplasticity.

Furthermore, the effects of estrone also depended on whether the rats had experienced motherhood: estronebased HT impaired learning in middle-aged rats that were mothers, while it improved learning in rats that were not.

"We've shown that motherhood alters cognition and neuroplasticity in response to hormone therapy, demonstrating that motherhood permanently alters the brain," says Dr. Liisa Galea.

As estrone is a component of the most common form of HT prescribed for women in the US, these findings could have implications for the treatment of age-related neurodegenerative disorders in women.

"Hormones have a profound impact on our mind. Pregnancy and motherhood are life-changing events resulting in marked alterations in the psychology and physiology of a woman. Our results argue that these factors should be taken into account when treating brain disorders in women," concludes Dr. Liisa Galea.

Dr. Galea studied how two forms of estrogens, estradiol and estrone, affect neuroplasticity.

a community of care

Clinician-scientists at the Centre know that the best patient outcomes come from early detection and intervention. In each of our six clinics, we're pursuing a deeper understanding of the brain in health, injury and disease, knowing that what we learn from treating and investigating one disease of the brain will advance our understanding of others. Together, we're working to uncover the root of neurodegeneration and find targeted treatments to alleviate, prevent and cure neurological disease.

"Already, our multi-disciplinary, collaborative approach is attracting international attention and building UBC's reputation for excellence," says Dr. Jon Stoessl, co-director of the Djavad Mowafaghian Centre for Brain Health. "We are poised to lead the world in translating fundamental neuroscience discoveries into new strategies for the prevention and treatment of brain diseases."

Genetic counsellors provide unique benefits to Alzheimer patients

"Is genetic testing available for Alzheimer disease?' is one of the most common questions I hear in the Clinic," says Emily Dwosh, a genetic counsellor in the Clinic for Alzheimer Disease and Related Disorders (CARD) at the Djavad Mowafaghian Centre for Brain Health.

"Another common question is, 'Are other members of my family at risk for dementia?""

CARD is a multi-disciplinary Vancouver Coastal Health clinic where patients can expect to meet with different health care professionals throughout the day of their appointment.

"Many people aren't sure what to expect when they see 'genetic counselling' booked on their schedule," says Colleen Guimond, a genetic counsellor who facilitates much of the interaction between patient care and research at the clinic.

Genetic counsellors are health professionals with specialized training and experience in the areas of medical genetics and counselling. Genetic counselling for patients with Alzheimer disease and other memory disorders is a unique feature of CARD, and one that can ease a lot of the worry that comes from receiving a diagnosis of these conditions. "Genetic counsellors at CARD meet with patients who have recently been diagnosed with dementia or with people who are concerned because of their family history," Colleen explains. "During our session, we document the family history and use our time together to ensure that patients leave with a good understanding of their own diagnosis and implications for their relatives."

Typical sessions include a review of the patient's diagnosis and the different types of dementia, the chances for this condition to affect other family members, and conversations about the availability and implications of genetic testing.

"Only rarely does dementia have a purely genetic cause," says Emily.

Alzheimer disease is most often caused by a complex interaction between genetic and environmental factors, with age being the greatest risk factor. This is reassuring to many families who assume that their relatives are at a high risk to develop the condition as well.

"It is especially satisfying to be able to take findings discovered through local research and use them to inform our clinical practice."



Colleen Guimond and Emily Dwosh

"We spend a lot of time talking about healthy brain aging and protective actions family members can take to help preserve cognitive function," says Emily.

Genetic counsellors are often the interface between patient care and research, providing patients with access to current information about clinical trials and facilitate other opportunities for interested patients to participate in research.

"There's always been a link between research and clinical care," says Colleen. Since 1985, genetic counsellors with CARD have been collecting family histories to establish hereditary elements of disease, to match patients to research studies, and to serve as a liaison between patient care and research.

"It is especially satisfying to be able to take findings discovered through local research and use them to inform our clinical practice."

"Working as a genetic counsellor in a specialized clinic offers many unique opportunities," notes Emily, who has been with the Clinic since 2001. "By having a special focus on the genetics of dementia, and by following families over a long period of time, we are able to address common issues, provide ongoing support, and draw on our experiences with previous patients to tailor the care of new families."

Local leadership for global initiative to address the economic burden of mental illness

According to the Asia-Pacific Economic Cooperation (APEC), "Mental illness accounts for one-third of all chronic disease burden," and "it is a key element of socio-economic concern." A foundational piece of APEC's strategic plan for easing the economic burden of adverse mental health in member countries, partners established The Digital Hub, a collaborative, multi-national web-based platform with leadership from Dr. Raymond Lam and Canadian researchers, including several at the University of British Columbia. "This is an important global mental health initiative," says Dr. Lam, Executive Director of The Digital Hub and Head of the UBC Mood Disorders Centre. "There's a distinct convergence of economic impacts related to mental illness, particularly in lower-income countries, and we now have an opportunity to address this."

The burden of mental health issues, especially depression, on global economies is staggering, with as many as one in three people suffering from the effects of mood disorders. These effects range from cost of care to decreased productivity, leading to a lost global economic output of \$800 billion per year. The Digital Hub will emphasize evidence-based approaches to implementing best practices and policies for care, reducing costs, and establishing guidelines for psychological health and safety in the workplace.

The Digital Hub is a web-based, interactive resource designed to facilitate the establishment of partnerships to implement the APEC Roadmap to Promote Mental Wellness in a Healthy Asia-Pacific, an initiative to improve productivity and wellbeing among member countries.

According to the Asia-Pacific Economic Cooperation (APEC), "Mental illness accounts for onethird of all chronic disease burden."

"There's a huge opportunity here to involve tech and pharmaceutical industry partners in public- and private-sector collaborations," says Dr. Lam. "We're looking for those partnerships now."

The Digital Hub will connect researchers, policy-makers and clinicians from across the Asia-Pacific region, and Canada's leadership role in this initiative is significant. "This will showcase Canadian research, and highlight researchers across the country, including here at UBC," says Dr. Lam. "APEC has acknowledged the economic benefits of mentally well populations, and that prevention and treatment of mental disorders is beneficial for everyone. For Canadians, this is an unprecedented opportunity to demonstrate leadership and excellence in global mental health research, policy, treatment, and prevention."

The 21 APEC member economies represent 2.6 billion people and 60 per cent of the world's gross domestic product and 47 per cent of world trade.

Knowledge-sharing event unites the NMO community in the spirit of collaboration

The fourth annual Neuromyelitis Optica (NMO) Patient Knowledge Exchange Day was held on Saturday, November 28, and brought patients, family members, friends, caregivers, students/trainees and the general public to UBC to meet, collaborate, and learn about the latest in research and treatment for NMO.

NMO is a rare but unpredictable immune disorder, and those affected by it can lose vision in one or both eyes (optic neuritis) and can experience numbness or weakness in their arms and legs (transverse myelitis).

Dr. Tony Traboulsee, director of the NMO Clinic and Research Program, and Dr. Rob Carruthers presented and answered questions during the day-long event. The event attracted over 130 participants from around the province and also from Oregon and Alberta.

Approximately 150 people in BC have been diagnosed with this rare autoimmune disease and most have been referred to the NMO Clinic and Research Program. The NMO Clinic and Research Program at the Djavad Mowafaghian Centre for Brain Health is the only program in Canada dedicated to the treatment and investigation of NMO.



Under the direction of Drs. Traboulsee and Carruthers, the NMO group aims to raise awareness, educate and disseminate information about the disorder to health care providers and the public.

"We understand there are significant functional, social and psychological impacts on NMO patients and their family and friends," says Dr. Traboulsee. "While information about this disorder is limited, we hope that by bringing together patients, researchers, and clinicians, we can improve our shared understanding and move research and care forward."

Dr. Tony Traboulsee (top) and Dr. Robert Carruthers (bottom)



A journey of hope

When Linda Blanchet was diagnosed with early onset Alzheimer disease in 2012 at age 56, she and her husband Paul were bewildered.

"To be honest I didn't really know what Alzheimer disease was," said Paul, looking back on the life-changing moment. "I knew that it was a disease of older people and it was dementia, but that's all."

Today Paul can rattle off a long list of things he now understands about the disease that materializes in the brain. Alzheimer disease affects a person's memory, mood, and behaviour; it progresses over time and will eventually lead to death. Scientists are just starting to understand its cause and there is an enormous worldwide effort to find treatments to prevent or slow the progression of dementia.

After Linda was diagnosed, they relied on the Alzheimer's Society of BC to learn about the disease and how to live with the illness. It's meant making significant changes. While they still socialize and holiday with their two children, they try to keep a daily routine for Linda.

"Linda has been a very, very social person all her life," said Paul. "What's happened now is that she's not comfortable with people; it's just overwhelming. We've got a fairly quiet lifestyle. We get out and do things and visit family but after an hour or two, it's quiet time."

Now, once a year, the Blanchets make the four-hour drive from their home in Kamloops to UBC's Point Grey campus, their alma mater, and the Djavad Mowafaghian Centre for Brain Health to meet with Linda's doctor at the Clinic for Alzheimer Disease and Related Disorders.

By bringing researchers alongside the clinicians who treat Linda, the Centre is taking an innovative approach to accelerating the search for therapies for diseases like Alzheimer. For Linda, the building represents not just thoughtful clinical care—but hope for her future.

training the future of Neuroscience

Dr. Tim O'connor

Highlights

THE GRADUATE PROGRAM IN NEUROSCIENCE

- Administered by the Faculty of Medicine and the Djavad Mowafaghian Centre for Brain Health and offers a coordinated program of graduate studies leading to M.Sc. and Ph.D. degrees in Neuroscience.
- The program comprises some 126 graduate students and 109 faculty members representing 13 Departments from the Faculties of Medicine, Science and Arts at UBC.
- Approximately 50 per cent of students receive external funding.
- Students conduct hands-on research in laboratories located across the UBC campus, as well as in several hospitals and research institutes throughout Vancouver.
- Over the past five years, the Graduate Program in Neuroscience has established partnerships with a wide variety of internationally renowned research Institutes, including the Allen Brain Institute (Seattle), Capital Medical University (Beijing), Zhejiang University (Hangzhou) and University of Groningen (Groningen).

A letter from Dr. Tim O'Connor

Director, Graduate Program in Neuroscience at the Djavad Mowafaghian Centre for Brain Health

It's our goal to provide an environment in which high-calibre students from faculties and departments across the university, and from research institutions around the world, can obtain the highest quality education and training in neuroscience research. Students at the Centre go on to successful careers in medicine and research, and in industry and academia, both domestically and abroad.

At this time there is a rich exchange of students and faculty and joint degrees are being explored with our partner institutions. One of the outcomes of the partnership between the Graduate Program and the Allen Brain Institute has been the development of a number of innovative training workshops in bioinformatics and gene expression dataset and brain connectivity analyses. Currently the Graduate Program is taking a leadership role in developing an undergraduate program in Neuroscience.



There is a strong institutional support from the Faculty of Graduate Studies and the Faculty of Medicine. Graduate Studies provides five four-year, fully funded scholarships per year to attract top students to the program.

In addition, the Faculty of Graduate Studies provides approximately \$125,000 in the form of entrance scholarships and tuition fee waivers for students accepted into the program. In addition to providing the budget for the day-to-day activities of the graduate program, the Faculty of Medicine provides funding for a number of additional training opportunities including workshops on cutting edge imaging technologies, big data management and analysis and bioinformatics. In addition, the Faculty of Medicine was instrumental in supporting the recent construction of the Neuroimaging and Neurocomputation Centre which, under the leadership of Dr. Kurt Haas and Dr. Tim Murphy, has been a key addition to the training program.

The Graduate Program in Neuroscience provides exceptional training to students who go on to create, innovate, and continue to explore. We are immensely proud of the work they do here, and of what they will go on to achieve.

STUDENT PROFILE

Jenna Smith-Forrester

Jenna Smith-Forrester came to UBC in 2013 as a master's student in the Graduate Program in Neuroscience, supervised by Dr. Jon Stoessl. She was attracted to UBC because it allowed her to combine her passion for neurology and her collaborative approach to research. Her work, based in the Djavad Mowafaghian Centre for Brain Health, will improve our understanding of the role of tau, a protein that's important to the proper functioning of the brain and central nervous system. When misfolded, tau is known to contribute to neurological conditions such as Alzheimer disease.

Jenna started the MD program at UBC in August, and as part of the cohort in the Northern Medical Program, relocated to Prince George in January. There, she is applying her experiences in the Centre to her research and studies. "While I have enjoyed my experiences in both bench-based and clinical research, I am motivated to think on a much grander scale that encompasses population health," she says.

Dr. Tim O'Connor



Katherine White and Brendan Taylor

"I have a very personal connection to neurodegenerative disorders and thus great motivation for pursuing a career in neurology. Now more than ever, it's about identifying innovative, team-based approaches to providing specialist services in rural areas, and I'm excited to be a part of this movement!" With her training at the Djavad Mowafaghian Centre for Brain Health, she'll be able to do just that.

FUTURE STUDENT PROFILE

Brendan Taylor

Neurology has fascinated Brendan Taylor since Grade 2. His curiosity grew as he read more about the regions of the brain and learned how neurons work.

"The brain is delicately balanced and yet it has so much computing power," says Brendan, 12. "You think of the centre of your being as your heart because of your feelings, but really, your brain is the centre of you."

This year, Brendan's Grade 7 experience includes the mentorship of Katherine White, a research assistant in Dr. Lara Boyd's Brain Behaviour Lab in the Djavad Mowafaghian Centre for Brain Health. As part of the Vancouver School Board's Making Contact mentorship program, Brendan and Katherine are exploring the centre and planning a project together. "It's wonderful to have programs like this to give students an inside look at topics that interest them and expand on what they learn about in school," Katherine says.

Since Brendan is interested in reading, he wants to test whether different passages from books influence a reader's thinking. His idea is to ask people to read from Fyodor Dostoyevsky's *Notes from the Underground* and from Dr. Seuss' *Many Coloured Days.* After reading each passage, participants would complete a Stroop test that involves saying the colour of the word, when the letters b-l-u-e appear in yellow and the letters r-e-d appear in green.

"It's surprisingly hard because you're used to reading the word," Brendan says. "We think being exposed to a great amount of words or colours would have a different bearing on the result."

Brendan will present his preliminary project idea to Dr. Boyd's lab for feedback and the finished product—a research poster—at the Vancouver School Board office in June.

"You think of the centre of your being as your heart because of your feelings, but really, your brain is the centre of you." The Djavad Mowafaghian Centre for Brain Health represents a partnership between Vancouver Coastal Health and the Faculty of Medicine at the University of British Columbia. The centre was made possible with a generous donation from the Djavad Mowafaghian Foundation, as well as contributions from other philanthropists and leaders, as well as those of the federal and provincial governments. **a place of mind** THE UNIVERSITY OF BRITISH COLUMBIA

The University of British Columbia is one of Canada's largest and most prestigious public research and teaching institutions and consistently ranks among the top 40 institutes in the world. It offers a range of innovative undergraduate, graduate and professional programs in the arts, sciences, medicine, law, commerce and other faculties. UBC has particular strengths in biotechnology, ranks in the top 10 universities in North America and number one in Canada for commercializing research, and for its patent activity in the life sciences. | www.ubc.ca



Vancouver Coastal Health provides a full range of health care services, ranging from hospital treatment to community-based residential, home health, mental health and public health services, to residents of Vancouver, North Vancouver, West Vancouver, Richmond, and in the coastal mountain communities. | www.vch.ca

Vancouver CoastalHealth Research Institute Healthier lives through discovery

Vancouver Coastal Health Research Institute (VCHRI), a world leader in translational health research, is the research body of Vancouver Coastal Health Authority. VCHRI includes three of BC's largest academic and teaching health sciences centres – Vancouver General Hospital, UBC Hospital, and GF Strong Rehabilitation Centre – as well as many other hospitals and public health agencies across Vancouver Coastal Health. VCHRI is academically affiliated with UBC Faculty of Medicine and is one of Canada's top funded research centres receiving between \$80-100 million in research funding annually. Over 1500 personnel are engaged in a variety of research centres, programs and evolving research areas.





a place of mind The UNIVERSITY OF BRITISH COLUMBIA





The University of British Columbia 2215 Wesbrook Mall Vancouver, BC V6T 1Z3

centreforbrainhealth.ca











MS/MRI Research Group scans showing where MS lesions may develop in the brain. Researchers will use these images to develop prognostication tools that will lead to personalized treatment to alleviate and repair damage to the brain.