

BY THE NUMBERS

# Krembil Brain Institute

The Krembil Brain Institute is home to the largest and most specialized team of neuro professionals in Canada, and the largest combined clinical and research neurological facilities in North America. Here are some key things you need to know about Krembil and the diseases it researches and treats



## INSIDE KREMBIL BRAIN INSTITUTE

**100+**

Neurosurgeons, neurologists, neuroradiologists, neuroanesthesiologists, neuropsychologists, neurointensivists and neuroscientists at Krembil

**400**

Nurses and other allied health professionals employed by Krembil

**100+**

Researchers focused on neuroscience

**112,330**

Outpatient visits each year

**3,340**

Inpatient visits each year

**2,575**

Neurosurgical procedures performed each year

**154,000+**

Square feet of dedicated research space

## BRAIN HEALTH IN CANADA

**1 in 3**

Canadians affected by a brain disease, disorder or injury in their lifetime (Brain Canada)

**50,000**

Canadians who experience a stroke each year (Heart and Stroke Foundation)

**1,000+**

Number of diseases, disorders and injuries that affect the brain, spinal cord and nervous system (Brain Canada)

**42**

Number of Canadians diagnosed with epilepsy every day (Epilepsy Canada)

**500,000**

Canadians with Alzheimer's disease (Alzheimer Society of Canada)

**1 in 5**

Adults with chronic pain (Centers for Disease Control and Prevention)

**100,000**

Canadians with Parkinson's disease (Parkinson Canada)

**\$60 billion**

Cost of dementia and neurodegenerative diseases to the Canadian economy each year (Brain Canada)

# How implants can kickstart the brain

At CRANIA – the Center for Advancing Neurotechnological Innovation to Application – clinicians, neuroscientists and engineers are combining state-of-the-art technology with the human brain. They are developing implants that can jumpstart parts of the brain that are affected by such diseases as Parkinson’s, epilepsy, stroke and Alzheimer’s disease. These devices will one day also be able to treat spinal cord and peripheral nerve function. Here’s what you need to know about CRANIA

**3 to 5 years**

The timeline for refining many of these devices, making them more accurate – and available – to Ontarians.

**\$9 million**

Cost of equipment in a soon-to-be developed neuromodulation suite at Krembil. This operating suite will include advanced MRI imaging and special equipment to precisely target regions of the brain.

## WHO’S LEADING THE RESEARCH?

Directors of CRANIA



**Dr. Milos Popovic**  
Institute Director, Toronto Rehabilitation Institute, University Health Network; Krembil Brain Institute collaborator

**Dr. Taufik Valiante**  
Co-director, Epilepsy Program, University Health Network; Neurosurgeon and Scientist, Krembil Brain Institute

**2018**

747,000 Canadians living with dementia<sup>1</sup>



**2031**

937,000 Canadians living with dementia

**an increase of 66%<sup>2</sup>**

**18.9%**

Percentage of Canadians over age 18 suffering from chronic pain<sup>3</sup>

**50%**

Percentage of Canadians who will have or have had a mental illness by age 40<sup>4</sup>

## CONDITIONS THAT COULD BE TREATED

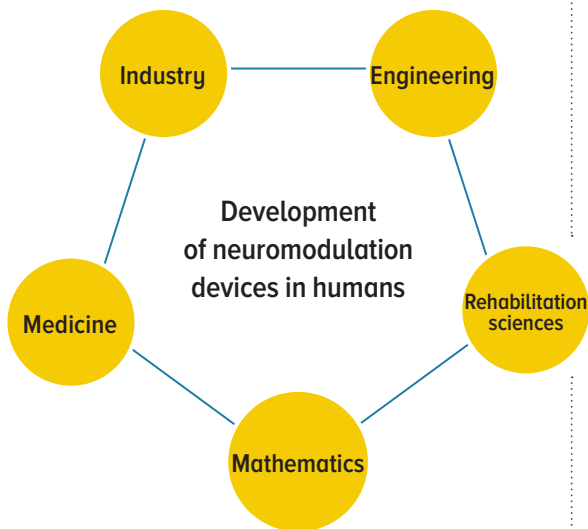
- Parkinson’s
- Epilepsy
- Stroke
- Spinal cord injury
- Alzheimer’s and dementia
- Depression
- Chronic pain



“It’s hard to convey the excitement in the field. There are so many things changing so rapidly. With our aging population there are a lot of conditions that will be costing society a lot of money. We realize that we are not going to be able to fix these things alone.”

– Dr. Taufik Valiante

## A TEAM EFFORT



## Q&A

### A quicker way to treat depression

Dr. Jonathan Downar discusses how an innovative brain-imaging technology could help patients with mental illness feel better faster

Anna Sharratt

Anyone who has suffered from depression knows it can take years to find a treatment that works. An underused technology, though, could speed up that process and allow doctors to treat this illness in ways they haven’t been able to before.

In 2002, Health Canada approved repetitive transcranial magnetic stimulation (rTMS), a treatment technique using a device that delivers powerful magnetic pulses through a coil held close to the head. Pulses activate the brain’s neurons and can rewire and reset their connections, which then helps the brain to work properly. This technology has been slow to catch on – it requires lengthy sessions and it’s expensive. We spoke to Dr. Jonathan Downar, co-director of University Health Network’s rTMS clinic, who says that’s changing.

#### WHY DOES rTMS WORK SO EFFECTIVELY TO TREAT A RANGE OF PSYCHIATRIC DISORDERS?

We have various brain networks that help with basic functions like vision, hearing and movement, or complex functions like regulating thoughts and emotions. One network, called the salience network, is essential for the self-control of thoughts, behaviours and emotions. A course of rTMS to this network can restore its activity. Patients say they feel more in control and have a better capacity to cope with stress without getting overwhelmed.

#### WHAT’S HAPPENED WITH rTMS LATELY?

A recent brain-stimulation study conducted by three rTMS centres (Krembil, CAMH and UBC) examined the effectiveness of intermittent theta burst stimulation (iTBS), a newer form of rTMS. It found that treatments can be shortened from 38 minutes to three minutes. Thanks to our study, the iTBS treatments were recently approved by the U.S. Food and Drug Administration.

#### WHAT DOES THAT MEAN FOR PATIENTS?

Clinics can provide access and treatment to many more patients a day. The treatment will also cost less – about \$1,000 instead of up to \$10,000. This could finally lead to rTMS being covered by most Canadian provinces.

#### WHERE DO YOU SEE rTMS GOING?

It’s expanding. There are more than 1,300 clinics today in the U.S., with hundreds opening in China. There are fewer than 25 clinics in Canada, but we hope this will improve. The techniques are also getting faster and safer. Some studies show that you may be able to get the full effect in as little as five to 10 days by giving multiple sessions per day.

## Surgical training goes the distance with new web tool

Krembil’s NEURONproject is training the next generation of neurosurgeons around the globe

Anna Sharratt



Health resources are scarce in low- and middle-income countries. With many patients and relatively few doctors, it can be difficult to give surgeons in these areas the best possible training. Many surgical programs need greater structure to their curriculum, including more insights around when to operate and what research studies can help improve care.

This need drove the creation of the non-profit NEURONproject (Neurosurgical Education with Universal Reach Online), a web-based education hub that offers neurosurgery residents long-distance surgical training. Established in 2011 and funded through private donations, the project helps surgeons learn how to make sound decisions and manage patients in the most ideal manner. Surgeons can access information and connect with faculty remotely from anywhere in the world.

“We frequently think of surgery as mainly technical skills,” says Dr. Mojgan Hodaie, founder of NEURONproject, and a Krembil Brain Institute neurosurgeon. “But there is a wealth of knowledge and a clear structure of decision-making that allows us to apply the technical skills at the

right time, for the right patient. It is the combination of these two different skill sets that characterizes surgical competency.”

To that end, NEURONproject uses an online curriculum to achieve two clear objectives: Ensuring doctors have a strong knowledge base in the clinical sciences and helping them focus on the management of specific diseases and cases. It’s currently partnered with sites in Southeast Asia, such as the emerging training program in Cambodia, says Dr. Hodaie.

“We’re delivering the foundations of the curriculum to residents online,” she says. “We interact in an online class environment and meet face-to-face about once a year, when we have several days of workshops and intense case discussions.”

This kind of program is especially important in a region like Southeast Asia, where crowded streets and complicated city layouts are a huge source of head and spine traumas. Improving neurosurgery will have a big impact, says Dr. Hodaie. “This program is an important humanitarian endeavour,” she says. “Better training assists them in helping their people and their communities.”

Sources: <sup>1</sup>Alzheimer Society Canada, 2011 figures. <sup>2</sup>Alzheimer Society Canada, 2018. <sup>3</sup>Pain Research and Management, Nov.-Dec., 2011. <sup>4</sup>Canadian Mental Health Association, 2013.