



Brainnovation

SNAPSHOT

Neurodegeneration

What is neurodegeneration?

Neurodegeneration describes the gradual deterioration in a person's cognitive abilities, such as memory. This loss is due to either structural changes that prevent neurons (brain cells) from functioning normally, or to cell death.

Neurodegeneration is a key feature of several diseases that are referred to as "neurodegenerative diseases". The most notable among them are: Alzheimer's disease, Parkinson's disease, Huntington's disease, Amyotrophic Lateral Sclerosis (ALS), Frontotemporal Lobar Degeneration (FTLD) and Vascular Cognitive Impairment (VCI).

What causes neurodegeneration?

A small proportion of neurodegenerative diseases is due to genetic mutations (~5%). The remaining cases are thought to be caused by

- the accumulation of toxic proteins in the brain, and
- the brain's "energy-producing components" (mitochondria) are not functioning efficiently and creating toxic molecules that damage neurons.

Although the causes can vary, scientists agree that the net result is a triggering of the cell's "programmed cell death" pathway, a sort of deliberate cell suicide that is supposed to protect the surrounding brain cells from toxic molecules.

What you need to know!

- A healthy diet, exercise and cognitive enrichment (e.g., education, brain games) can help minimize the symptoms of a neurodegenerative disease, delay the onset, or minimize the risk.
- Early detection is key, so speak to your doctor if you notice abnormal changes in your memory, a slight shakiness in your hand that goes away when you do something, slurred speech, muscle weakness and/or twitching in the hands or feet.
- Only 5% of Alzheimer's disease, Parkinson's disease and Amyotrophic Lateral Sclerosis (ALS) cases are caused by genetic mutations.

How is neurodegeneration treated?

Currently, there are no cures for neurodegeneration. For each of the neurodegenerative diseases, there are specific drugs that can be used to minimize their symptoms (such as donepezil and memantine for Alzheimer's disease, L-dopa for Parkinson's, riluzole for ALS).

What is the gap?

It's big. An estimated 285,000 Ontarians currently have some form of neurodegenerative disease (i.e., Alzheimer's disease or Parkinson's disease or ALS or Huntington's disease). They rely on their family and caregivers to help them with their daily activities. And with our

aging population, this number is expected to increase dramatically (e.g., 255,000 Ontarians will suffer from Alzheimer's by 2020).

Patients seldom have “pure” Alzheimer's disease or “pure” Parkinson's disease, but rather a mixture of symptoms. However, the traditional research models involve researchers investigating a specific disease, as opposed to commonalities among diseases. As such, the diseases researched in the laboratory do not always represent what doctors see in their patients.

What is the OBI doing to address the gap?

For the first time ever, the OBI has brought together researchers, clinicians, industry, and patient advocacy groups from the Alzheimer's, Parkinson's, ALS, and vascular fields to form a united front against neurodegenerative diseases. They have identified several core research objectives, which include to

- study the diseases together, as opposed to individually,
- better understand the genetics of neurodegeneration,
- better understand the earliest signs of neurodegeneration,
- develop tests for identifying neurodegenerative diseases quickly, before too many brain cells die, and

- identify sub-populations that might respond best to specific treatments (i.e., personalized medicine) so that patients can stop the disease sooner.

This integrated discovery system will improve our understanding of neurodegeneration and help develop new treatments that address the cause of neurodegeneration, and not just the symptoms.

Hope for the future

This work stands to make Ontario a world leader in the development and translation of neurodegeneration knowledge, commercialization, and ultimately the best place in the world to receive care.

About the Ontario Brain Institute

The OBI drives Ontario's leading scientists to accelerate the discovery of new treatments for the many brain disorders that plague one in four Canadians. We believe that major advances in diagnosis, therapy and cure will only come from developing a new system of discovery. This means doing science differently and funding it differently as well. In both these roles, the Ontario Brain Institute acts as a transforming catalyst.

To learn more about addiction what is being done in Ontario – visit www.braininstitute.ca