

When olfaction rhymes with cognition

In the Graham laboratory we work on understanding the link between the sense of smell and our mental processes including problem-solving, learning, and memory. Our goal is to develop, validate and promote the use of olfactory tests and olfactory therapy in order to delay cognitive decline and attenuate neuropsychiatric symptoms such as depression, aggression, and anxiety.



The Challenge

Dementia in numbers

- Number of dementia cases worldwide: **more than 55 million**
- Percentage of seniors that have Mild Cognitive Impairment: **~ 24%**
- Economic burden of dementia **worldwide: more than \$1.3 trillion**

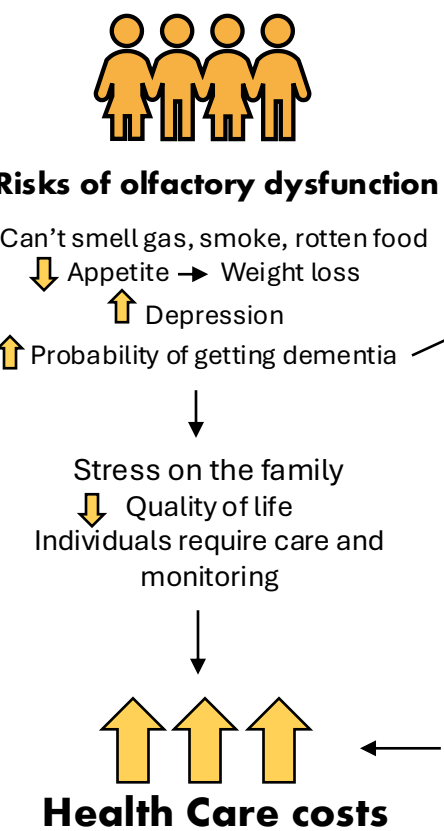
This has a huge impact on the individual, on families and on society. Indeed, many countries cannot afford dementia care. Even in Canada, it is difficult to get appropriate care. **We desperately need cost-effective, efficient strategies that delay onset of dementia.**

Olfactory loss in neurodegenerative diseases

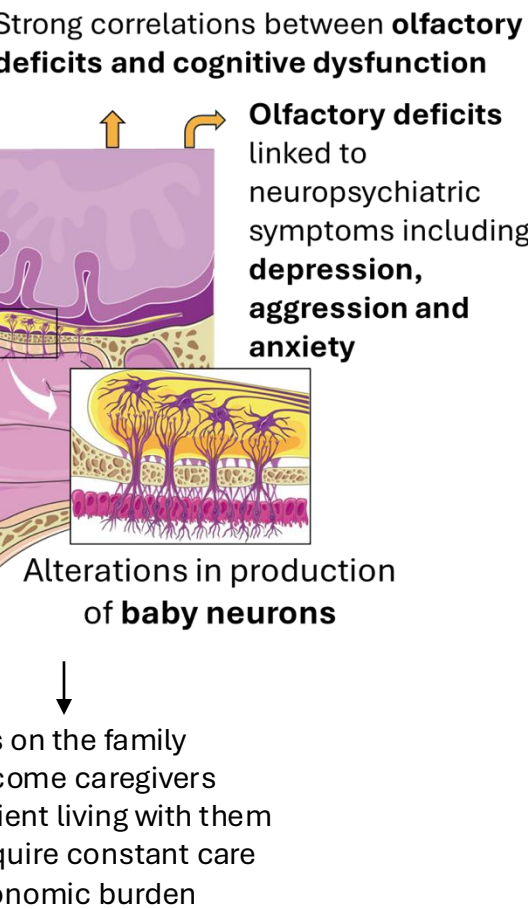
Loss of olfactory function is one of the earliest symptoms in conditions such as Alzheimer's disease, Mild Cognitive Impairment, Parkinson disease, and Stroke—affecting approximately 90% of cases. This loss is also linked to a higher risk of developing dementia and increased neuropsychiatric symptoms, including depression, aggression, and anxiety.

Olfactory loss

General population



Dementia



The solution

Olfactory therapy

Olfactory therapy involves smelling 4 odors twice/day. Several companies now sell olfactory therapy kits. The odors act as a memory trigger and thus help us to access our memories. By its close relation to memory, it has been shown that olfactory therapy may improve not only olfaction, but also enhance cognitive functions, reduce depression symptoms and improve quality of life.

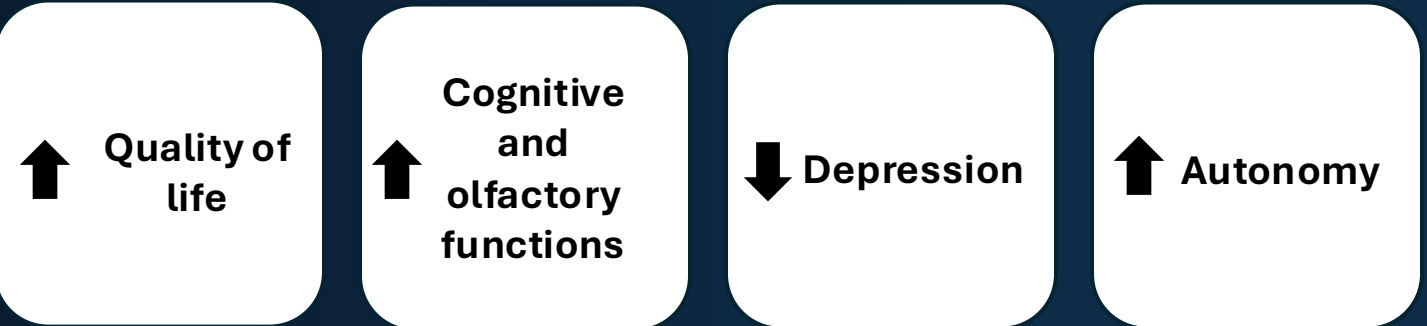
Mild Cognitive Impairment, Alzheimer and Parkinson disease all demonstrate early olfactory loss. Using this user-friendly and cost-effective therapy could help to delay and/or reduce the symptoms of these neurodegenerative diseases that **cost more than a trillion dollars** in health care expenses **worldwide** each year.

What is Olfactory therapy?



Duration: 3 months, Frequency: 2X / day

Olfactory therapy benefits



Cost of olfactory therapy kit ~\$30/person

Funding organizations that have supported our research

How to treat olfactory loss?

Standard olfactory tests and therapy exist but are not presently part of our public health care in Canada and thus not freely available for the general population. A public Smell and Taste clinic would make olfactory testing available to the general population and offer olfactory therapy.

Smelling the disease coming

Olfactory deficits can happen for several reasons including car accidents, traumatic brain injuries and/or related to the progression of diseases.

Here is a non exhaustive list of situations where olfactory deficits can occur:

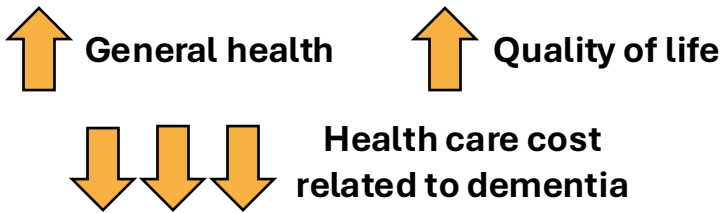
- Prolonged exposure to chemicals
- Infectious disease (Influenza, COVID-19)
- Head trauma
- Mild Cognitive Impairment
- Alzheimer and Parkinson disease
- Aging

How to differentiate the loss of olfaction in all these situations?

An innovative approach that the laboratory of **Professor Rona Graham** takes is to identify the odors related to the cognition loss in different diseases. An olfactory signature has been identified in different diseases, and the next step will be to validate these signatures in a larger population. In the future, we wish to develop and validate olfactory kits that will highlight disease-specific olfactory losses that will allow for early and affordable detection.



Benefits of a Smell and Taste clinic



Dementia care costs in Canada are **40.1 billion annually** (\$67,200/person/year). If just ~20% of the people with Mild Cognitive Impairment who will go on to get Alzheimer disease, are delayed in terms of getting Alzheimer disease, and even if the delay is only for one year, that would **save ~\$700 million/year**.

In Germany, olfactory testing—and therapy when needed—is mandated and integrated into the official Ear, Nose, and Throat (ENT) medical guidelines. In Dresden, Germany, the Interdisciplinary Clinic for Smell & Taste brings together healthcare professionals to provide testing, treatment, and research on olfactory disorders under one roof.



Funding will support

A change is needed in the treatment of olfactory dysfunction

Spreading the knowledge



Develop Health Care Policy



Establish Smell and Taste Clinics



Synthesizing and spreading the olfactory knowledge to clinicians, specialists, medical students and the public

- **Train clinical residents** to detect and treat loss of olfaction, fellowships available
- Develop a **web-based telehealth platform** that explains how to do olfactory testing and tests for cognitive function, what the results mean and if the results suggest deficits how to do olfactory therapy
- Present at: Neurology/Medical conferences, Physician seminars, Public events and Podcasts; and articles in scientific journals, magazines and public forums

Patients with and without neurodegenerative diseases should be tested for olfactory dysfunction

- Canadians in the general population who have issues with their sense of smell should be **tested for olfactory function** and referred to specialists
- Develop **disease-specific, efficient and affordable olfactory tests**
- Elementary school children should be tested for olfactory function as they are for vision and hearing

The general public and patients should be offered olfactory therapy

- **Olfactory therapy should be available** to all Canadians experiencing smell loss as a therapeutic strategy that may delay future health complications
- **Implement** an affordable and efficient smell-based sensory program for **individuals with dementia that cannot do the routine olfactory therapy protocol themselves**
- **Development of a Smell and Taste Clinic in Canada that specialises in olfactory testing and therapy**

Olfactory function plays a vital role in overall health. Investing in olfactory therapy may significantly reduce the billions of taxpayer dollars currently spent on dementia care.