

Researchers unveil new data and diagnostic tool at the world's largest Alzheimer's forum

July 26 2016

Two studies involving University of Waterloo researchers presented this week at the 2016 Alzheimer's Association International Conference (AAIC) in Toronto highlight a new diagnostic tool that can identify Alzheimer's disease long before the onset of symptoms as well as the increasing prevalence of Alzheimer's disease in Ontario.

Window to the brain

Alzheimer's disease is notoriously difficult to diagnose and nearly impossible to catch early. This could soon change with a new type of non-invasive eye scan developed and patented by Professor Melanie Campbell. It uses polarized light to highlight deposits called [amyloid proteins](#) found at the back of patients' retinas decades before they experience cognitive decline.

"Polarization imaging is promising for noninvasive imaging of retinal amyloid deposits as a biomarker of Alzheimer's," said Campbell, from Waterloo's Department of Physics and Astronomy. "The ability to detect amyloid deposits in the retina prior to disease symptoms may be an essential tool for the development of preventative strategies for Alzheimer's and other dementias."

In order to diagnose Alzheimer's disease and other forms of dementia, doctors currently rely on either a combination of late-stage symptoms and expensive positron emission tomography (PET) brain scans or tests

on the brain after death. The new method would give a less expensive, more available alternative to PET.

Campbell's research, in collaboration with colleagues at the University of Waterloo, UBC, Vivocore Inc, InterVivo Solutions, and the University of Rochester and Massachusetts General Hospital, establishes her diagnostic method's proof of concept in both human and an animal model. She shows polarized light scans are as sensitive as other more established methods and can be done cost-effectively without using irritating dyes, making it potentially useful as an in-office screening tool.

"Amyloid proteins are made up of protein fibres with different refractive indices along and across the fibres," said Campbell, also a professor in the School of Optometry and Vision Science. "They light up the same way as when scotch tape is placed between two polarizing filters. While other researchers thought that a dye was needed to make the protein visible, we were able to achieve the same results using optics and additional computer processing."

Amyloid beta protein deposits in the brain have been proven to be present in patients decades before they experience symptoms of the disease. Although the reasons this protein appears are still being debated, the fact that it also deposits in the retina, an extension of the brain, means these deposits can be used as a biomarker for diagnosing Alzheimer's disease long before symptoms appear.

"Early diagnosis is important, especially since treatment options are more limited later in the disease," said Campbell. "Widely available, inexpensive, early detection of amyloid would help researchers develop more effective treatments before the onset of symptoms."

The Canadian Institutes of Health Research and the Natural Sciences and Engineering Research Council of Canada funded Campbell's research.

She has just received more than \$800,000 in funding through a Collaborative Health Research Projects grant to build prototype instruments and start clinical testing soon on patients in collaboration with researchers at UBC Hospital, the Lawson Health Research Institute in London, Ontario and Institut Universitaire de Gériatrie de Montréal.

Campbell is the director of the Guelph-Waterloo Physics Institute as well as a member of the Waterloo Institute of Nanotechnology and the Centre for Bioengineering and Biotechnology.

Increased prevalence of Alzheimer's

According to a report co-authored by Professor Colleen Maxwell of Waterloo's School of Pharmacy, also presented at AAIC, the prevalence of Alzheimer's and other dementias rose more than 18 per cent in patients over 65 across Ontario over eight years, from 2004/05 to 2012/13. The study, which tracked prevalence, incidence and costs of dementias through Ontario health administrative data, was a collaborative effort with colleagues at the Institute for Clinical Evaluative Sciences (ICES), the Ontario Brain Institute and the University of Toronto.

"The increasing prevalence in Alzheimer's disease and other dementias is not unique or surprising," said Maxwell, also a professor in the School of Public Health and Health Systems at Waterloo. "The overall population is aging. This, along with greater awareness and earlier detection of dementia and improvements in the care of persons with dementia, may account for the increase in prevalence."

The team hopes to expand their study to explore ongoing trends in prevalence and incidence and to include other important data sources including information on patients' quality of life and other health care use and costs.

Provided by University of Waterloo

Citation: Researchers unveil new data and diagnostic tool at the world's largest Alzheimer's forum (2016, July 26) retrieved 3 May 2024 from

<https://medicalxpress.com/news/2016-07-unveil-diagnostic-tool-world-largest.html>

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