

Ask a neuroscientist...

AJDC is aimed at all who work with people with dementia, including those who are new to the dementia workforce and may want to learn more about the basics of dementia. This article is the first in a new four-part series by neuroscientist and AJDC Editorial Advisor **Dr Lezanne Ooi**, who will present short, easy-to-read answers to questions about neurological changes to the brain with dementia. In her first article, Dr Ooi answers this question:



‘What is going on in the brain of a person with Alzheimer’s disease as the disease progresses?’

There are approximately 100 different types of dementia. Alzheimer’s disease is the most common type, accounting for about two-thirds of all cases. Nearly 50 million people worldwide are affected by dementia. In fact, nearly 10 million new people are diagnosed each year, suggesting one person is diagnosed with dementia every three seconds (ADI online information; ADI 2015).

A healthy brain

A healthy brain has developed many protection mechanisms to make sure it functions appropriately, allowing us to communicate, make and retrieve memories and perform all of the other tasks that our brains must coordinate. I’m sure it hasn’t escaped your notice that during the normal process of ageing there are many changes to our bodies and to our brains. With ageing, many of us feel that we are not as quick as we used to be. Losing our keys or forgetting

Tips for practice

- Remember that memory problems are due to the disease – the person with dementia is not deliberately ignoring you or not paying attention.
- Be aware that memory problems are just one feature of Alzheimer’s disease, but there are a range of other signs and symptoms, for example language difficulties and reasoning.
- It is important for care providers and care partners to identify and work to the strengths of a person with dementia – those areas where the brain impairment is less or not evident.

someone’s name seems to happen more often as we get older.

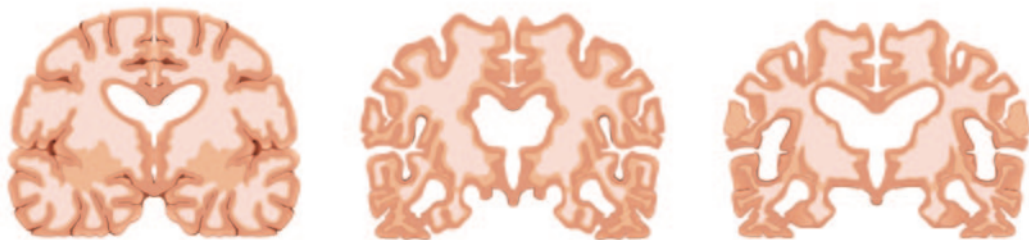
Toxic protein clumps

It is important to note that Alzheimer’s disease is not a part of *normal* ageing and is caused by a build-up of certain proteins that become sticky and collect together in clumps in the brain. Different types of dementia are characterised by these toxic clumps that contain specific proteins. The toxic proteins

that characterise Alzheimer’s disease are called amyloid beta and tau.

In the same way that we take out the rubbish for removal from our homes, a healthy brain is able to remove these toxic clumps and get rid of them before they can do any damage. However, in Alzheimer’s disease the brain’s ability to remove these toxic protein clumps is reduced. Very recent evidence suggests that these clumps increase in the brain over

Progression of Alzheimer’s disease



Over the course of Alzheimer’s disease, more of the brain is affected, resulting in death of the brain cells and reduction in brain volume (from left to right). Photo: www.freepik.com

Resources on Alzheimer's disease

The Brain: Dementia

The Queensland Brain Institute's (QBI) website has accessible online information about dementia, including Alzheimer's disease, and also offers a link to a free copy of Issue 3 of the QBI magazine *The Brain*, which focuses on dementia: <https://qbi.uq.edu.au/dementia>

Dementia Discovery

This 2020 series of free seven brief modules from Dementia Training Australia (DTA) is aimed at those new to the dementia workforce, and offers an introduction to the basics about the brain and dementia, including a module on Alzheimer's disease (which takes 15 minutes to complete): <http://bit.ly/Dementia-Discovery>

Alzheimer's disease

Dementia Australia and the National Institute on Aging in the US both publish helpful fact sheets giving an introduction to Alzheimer's disease: <https://bit.ly/3qThsGN> and <https://bit.ly/3ttaGtd>



decades, well before symptoms of Alzheimer's disease appear. Over a lifetime these clumps increase to the point that they change the structure of individual brain cells, affect their ability to function and ultimately cause the death of these brain cells.

For reasons that scientists still don't fully understand, certain areas of the brain are more susceptible to the toxic protein clumps than others. Some of the most affected areas control the parts of the

brain that are important for forming and retrieving memories – one of these areas is called the hippocampus. This is why people living with Alzheimer's disease and their families often identify an inability to remember new things as one of the first symptoms that they noticed.

As the disease progresses there is spreading of the clumps to other parts of the brain and eventually these areas can also succumb to the disease. For this reason, as the

degeneration continues, people living with Alzheimer's disease may develop difficulties with language, reasoning or social behaviour.

Promising research

Some parts of the brain are spared and seem to be more resilient against this disease. A major area of research now is trying to understand how certain brain cells protect themselves against cell death while others are more

sensitive to it.

Other promising areas of research include looking into reducing the toxic clumps during the very early stages of the disease, and boosting the brain's ability to remove the clumps. It is believed that if these protection mechanisms can be harnessed early enough in the disease course, they can be used to protect the brain against Alzheimer's disease. ■

References

Alzheimer's Disease International (ADI) *Dementia statistics* online information. Available at: www.alzint.org/about/dementia-facts-figures/dementia-statistics/ Alzheimer's Disease International (2015) *The Global Impact Of Dementia: An Analysis of Prevalence, Incidence, Cost and Trends*. World Alzheimer Report. London: ADI.

■ Dr Lezanne Ooi is a neuroscientist at the Illawarra Health and Medical Research Institute, Wollongong, and the School of Chemistry and Molecular Bioscience, University of Wollongong, NSW. To follow up with the author, email lezanne@uow.edu.au. The author is supported by a National Health and Medical Research Council (NHMRC) of Australia Boosting Dementia Research Leadership Fellowship (APP1135720)