# Alzheimer's Disease

## Description

Alzheimer's disease, (AD), is a complex disease that can generally be described as a progressive deterioration in mental cognition, the ability to perform daily functions, and gradual changes in behaviour. Biologically, AD is characterised by the formation of aberrant proteins in the brain called senile plaques (SPs) and neurofibrillary tangles (NFTs). These biochemical events are now considered the key pathological hallmarks of AD. The identification of *β*-amyloid (A*β*) in SPs and the deposition of A*β* is believed to be a pathological trigger in the disease, which subsequently leads to the formation of NFTs, neuronal cell death and dementia. However, it is not clear whether SPs and NFTs are the cause of the disease or merely reactive products resulting from neurodegeneration in AD. Other neurological studies including persons who suffered head trauma suggests that such deposits may in fact be a reaction to the disease process in order to help maintain cell function, neuronal growth, and survival.

Increasing evidence suggests that the development of AD and other related neurological disorders may in fact be the result of continuous insults and accumulation of damaging biochemical side products in the brain over many years before the clinical, behavioural and cognitive functions are obvious. A key factor that is increasingly becoming significant is the role inflammation and its damaging side products.

## Treatments

Currently there are no effective treatments for AD known. Drugs (i.e. cholinesterase inhibitors, NMDA receptor antagonists, and antipsychotics) currently used to treat AD have shown limited therapeutic value. New, potentially disease-modifying, therapeutic drugs targeting A*β* and tau protein are under development as well as novel antibodies that can potentially bind and dissolve these proteins. Consequently, research by both public and commercial organisations are developing drugs including active and passive immunization directed against A*β*, compounds that interfere with the secretases regulating A*β* generation, drugs to prevent A*β* aggregation and destabilize A*β* oligomers, and drugs targeting tau protein. Simultaneously, mitigating the effects of neuroinflammation is also attracting considerable attention in the management of AD. As AD is a long-term progressive disease, research to date has focused on the latter stages of the disease. With new imaging capabilities it is now possible to extend the study of AD patients to those with mild cognitive impairment using novel radiotracers such as the Aβ-amyloid imaging agent PIB. However, as prevention is always more effective than the cure, increasing attention is also focused on diet, exercise and lifestyle as ways to slow down the disease. This is particularly important as more evidence links the role of inflammatory processes with AD.

### Prognosis

Recent developments in molecular imaging technologies are rapidly changing the ways that AD is being characterised, assessed, diagnosed and monitored. Utilising, technologies such as Positron Emission Tomography or PET and specific radiotracers such as PIB, researchers and clinicians are not only able to study the molecular basis of the disease, but more significantly, can be used to assess and monitor the new treatments that are increasingly becoming available. Most significantly, these technologies utilising new radiotracers are offering the opportunity to study the mechanisms of the underlying pathology before the onset of AD. These developments are paramount as it is in these stages of the disease that potential treatments may be most effective.

## Further Information and Support

**National Institutes of Health - USA**
www.nih.gov

**Aetna InteliHealth - USA** (Look Up – Health A-Z)
www.intelihealth.com

**Alzheimer's Australia NSW**
PO Box 6042, North Ryde NSW 2113
Free Helpline 1800 100 500 or 9805 0100
www.alzheimers.org.au

**Alzheimer's Society - UK**
www.alzheimers.org.uk

**Australian Federal Government HealthInsite**
www.healthinsite.gov.au

The **Australian Imaging, Biomarker & Lifestyle Flagship Study of Ageing (AIBL)** is a study to discover which biomarkers, cognitive characteristics, and health and lifestyle factors determine subsequent development of symptomatic Alzheimer's Disease (AD).
www.aibl.csiro.au

**Global Alzheimer's Association Interactive Network** (**GAAIN**)
www.**gaain**.org

**Alzheimer's Disease Neuroimaging Initiative** (**ADNI**)
***adni***.*loni.ucla.edu*