Courtesy of NIH

New Hope for *Fading Memories*

Alzheimer's Disease

by Ronald McNeel, DrPH

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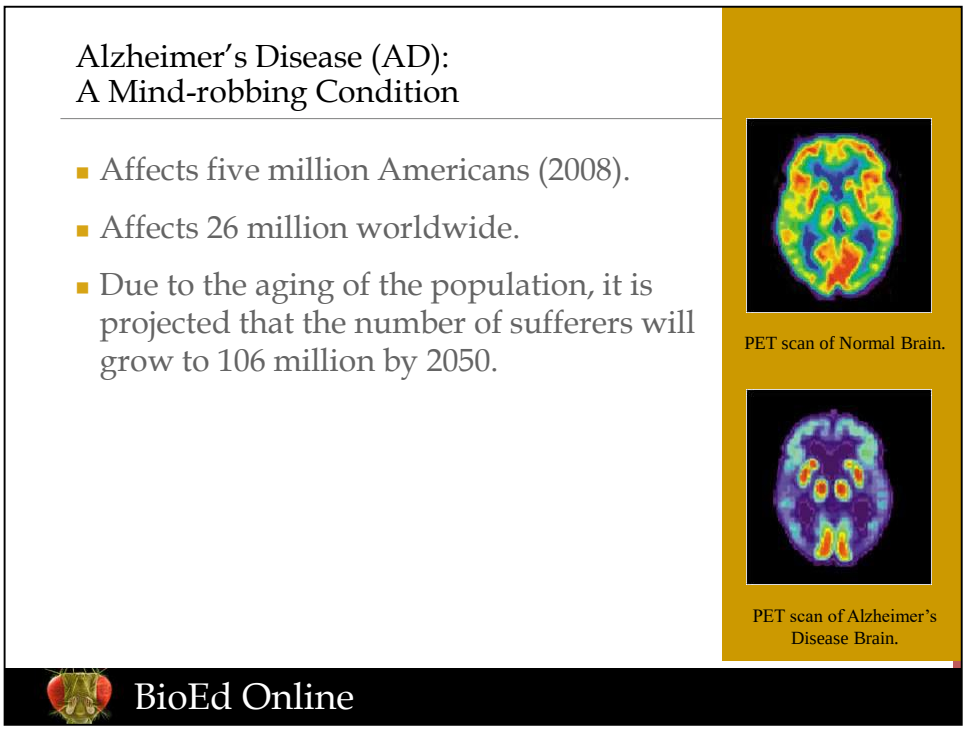
Image Reference

National Institute on Aging (2006). *Plaques and Tangles: The Hallmarks of AD*. Retrieved 8/1/08, from http://www.nia.nih.gov/Alzheimers/Publications/UnravelingTheMystery/Part1/Hallmarks.htm.



Alzheimer's Disease (AD) – *A Mind-robbing Condition*

Imagine walking into your kitchen and just standing there because you've forgotten how to prepare a bowl of cereal or toast bread. Add to this the nightmare of looking around and wondering where you are. Such is the average day for an individual suffering from a mind-robbing condition called **Alzheimer's disease (AD)**. It is estimated that Alzheimer's affects as many as five million Americans (1) and 26 million worldwide (2). And with the aging of our aging population, it is projected that the number of sufferers from this devastating disease will grow to 106 million by 2050.

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Alzheimer's Disease Education & Referral (ADEAR) Center, National Institute of Aging. (2008). *Alzheimer's Disease Fact Sheet*. Retrieved 8/1/08 from http://www.nia.nih.gov/Alzheimers/AlzheimersInformation/GeneralInfo

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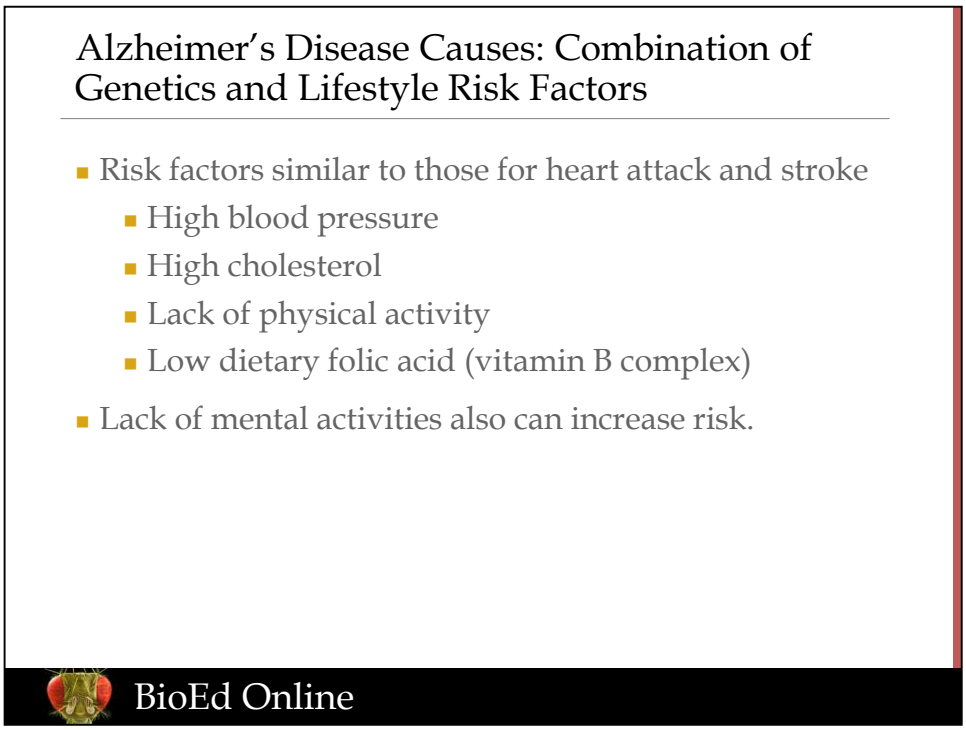
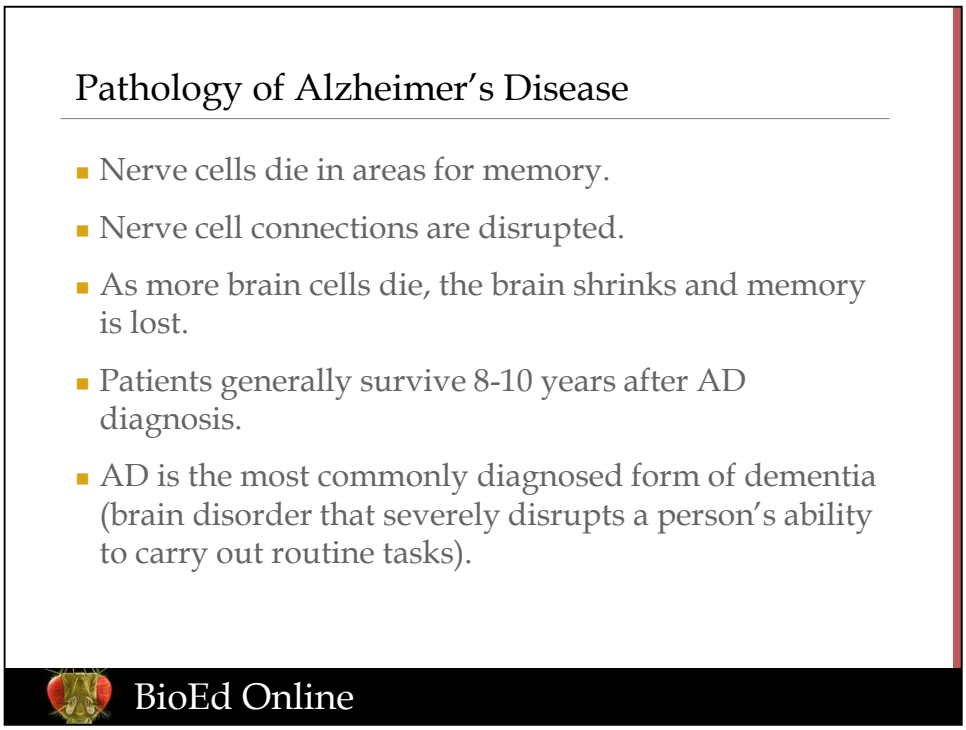


Alzheimer's Disease Causes: Combination of Genetics and Lifestyle Risk Factors

The causes of Alzheimer's Disease (AD) still are not completely understood. There is probably no single cause, but rather, a combination of factors that can lead to AD, including genetics and lifestyle risks. There is increasing evidence to suggest that some of the risk factors for heart attack and stroke (high blood pressure, high cholesterol, and low dietary folic acid—which is part of the vitamin B complex) also may increase the risk of AD. Lack of physical exercise and mental activities also can increase the risk of AD.

Reference

Alzheimer's Disease Education & Referral (ADEAR) Center, National Institute of Aging. (2008). *Alzheimer's Disease Fact Sheet*. Retrieved 8/1/08, from http://www.nia.nih.gov/Alzheimers/AlzheimersInformation/GeneralInfo.



Pathology of Alzheimer's Disease (AD)

Alzheimer's Disease (AD) is the most common form of **dementia**, a brain disorder that affects a person's ability to carry out routine activities. On average, patients survive about 8-10 years after being diagnosed with AD. Symptoms of AD arise as nerve cells die in areas of the brain necessary for memory, or as nerve cell connections are disrupted. As more nerve cells die, the brain shrinks and memory is lost.

Reference

Alzheimer's Disease Education & Referral (ADEAR) Center, National Institute of Aging (2008). *Alzheimer's Disease Fact Sheet*. Retrieved 8/1/08, from http://www.nia.nih.gov/Alzheimers/AlzheimersInformation/GeneralInfo.

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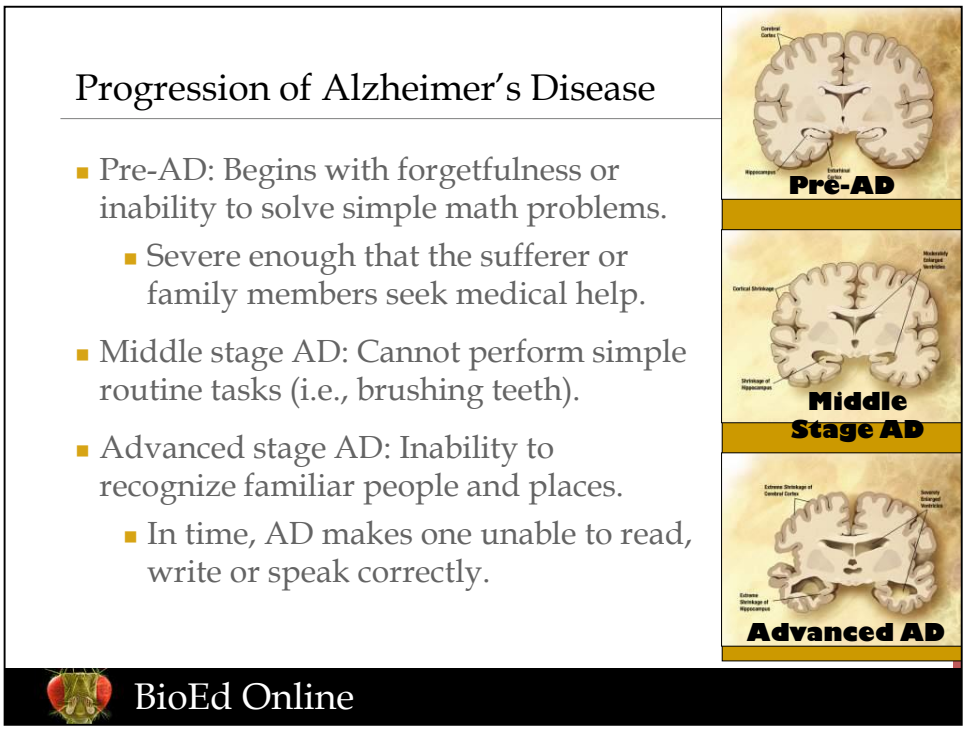

Progression of Alzheimer's Disease

Symptoms begin slowly, with forgetfulness or the inability to solve simple math problems. As Alzheimer's Disease (AD) progresses, symptoms may become severe enough that a person with AD or his/her family members seek medical help. Middle stage AD sufferers forget how to perform simple tasks, such as brushing their teeth. Advanced stages are marked by an inability to recognize familiar people and places, and eventually, the inability to read, write or speak.

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Alzheimer's Disease Education & Referral (ADEAR) Center, National Institute of Aging. (2008). *Alzheimer's Disease Fact Sheet*. Retrieved 8/1/08 from http://www.nia.nih.gov/Alzheimers/AlzheimersInformation/GeneralInfo.

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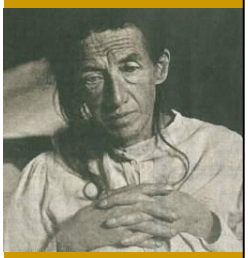
Disease Discovery

- AD named after German physician, Alois Alzheimer.
- In 1906, patient Auguste Deter died of unusual mental illness.
- During her autopsy, Dr. Alzheimer discovered abnormal structures.
  - Clumps in the brain (plaques)
  - Tangled nerve bundles (tangles)
- These structures later were identified as signs of AD.



Auguste Deter
(circa 1901)

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Disease Discovery

Alzheimer's Disease (AD) is named after the German doctor, Alois Alzheimer, who discovered two abnormal structures in the brain of a woman who died of an unusual mental illness in 1906. Dr. Alzheimer found abnormal clumps (now called beta-amyloid **plaques)** and tangled nerve bundles (now referred to as neurofibrillary **tangles)** in the patient's brain. Today, these abnormal structures are the focus of much research. The presence of either of is considered a sign of AD.

Reference

Alzheimer's Disease Education & Referral (ADEAR) Center, National Institute of Aging. (2008). *Alzheimer's Disease Fact Sheet* Retrieved 8/1/08, from http://www.nia.nih.gov/Alzheimers/AlzheimersInformation/GeneralInfo.

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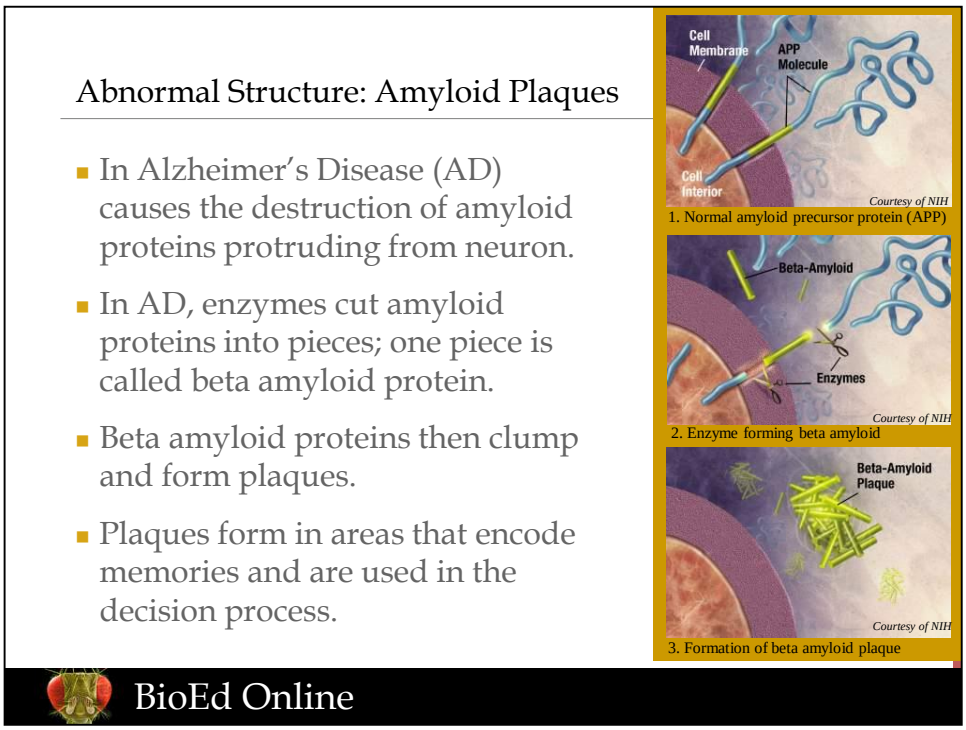


Formation of Beta Amyloid Plaques

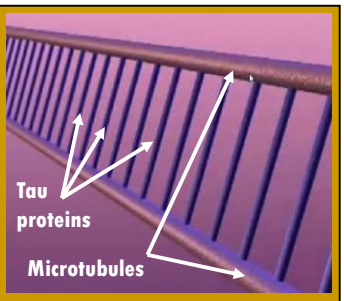
Amyloid precursor protein (APP) may help neurons to repair and grow after brain injury. APP is a transmembrane protein (part outside and part inside the cell). In Alzheimer's Disease (AD), enzymes cut APP into pieces. One of these pieces is called beta amyloid protein. Beta amyloid proteins clump together outside the cell and form insoluble **plaques**, which develop in areas of the brain that encode memories and are used in the decision process. It is still not known whether the **plaques** cause AD, or whether they are a product of the AD disease process.

Reference

National Institute on Aging, (2006). *Plaques and Tangles: The Hallmarks of AD*. Retrieved 8/1/08 from http://www.nia.nih.gov/Alzheimers/Publications/UnravelingTheMystery/Part1/Hallmarks.htm.

Formation of Tangles in Neurons

1. Microtubules provide internal support structure for neuron.
2. The protein, tau, supports and stabilizes these microtubules.
3. AD causes tau proteins to tangle, resulting in loss of microtubule stability.
4. Microtubules disintegrate.
5. Eventually, the neuron dies.



Normal tau supporting the microtubules

Twisted and tangled tau, disintegration of microtubules, and collapse of neuron structure

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Formation of Tangles in Neurons

In the case of **tangles**, microtubules form an support structure inside the neurons. The protein, **tau**, acts like a sort of scaffolding network to keep these microtubules stable. In Alzheimer's Disease (AD), changes occur that cause the support threads of **tau** to become tangled. Eventually, the neuron support structure collapses. This results in decreased communication and transport between neurons and ultimately, the death of the neurons.

Reference

National Institute on Aging. (2006). *Plaques and Tangles: The Hallmarks of AD*. Retrieved 8/1/08 from http://www.nia.nih.gov/Alzheimers/Publications/UnravelingTheMystery/Part1/Hallmarks.htm.

Video: Alzheimer's Disease Process

View the Internet-based video

"Alzheimer's Disease Process"

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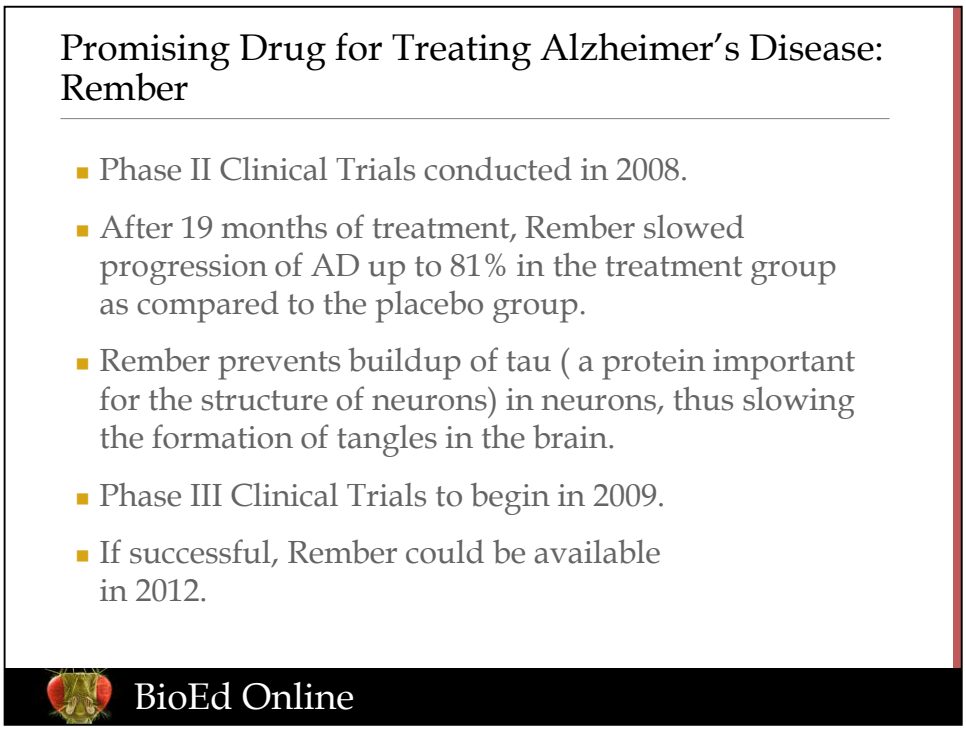
Video: "Alzheimer's Disease Process"

Reference

National Institute on Aging. (2008). *Alzheimer's Disease Process (video)*. Retrieved 8/1/08 from http://www.nia.nih.gov/NR/rdonlyres/F64F17F6-6624-4315-AC4C-D524D38D4642/0/progad.ram



Promising Drug for Treating Alzheimer's Disease: *Rember*

There is some promising news for sufferers of the life-altering illness, Alzheimer's Disease (AD). The International Conference on Alzheimer's Disease in Chicago (July 2008) reported encouraging results from Phase II Clinical Trials with the drug, **Rember**, developed by Singapore-based TauRx Therapeutics. A research team from the University of Aberdeen in Scotland, led by Professor Claude Wischik, conducted the studies with 321 patients from Britain and Singapore who had mild to moderate AD. After 19 months of treatment, **Rember** had slowed the progression of Alzheimer's Disease (AD) in the test group by up to 81%, compared to results from the placebo group (who did not receive the drug). **Rember** seems to target the buildup of the protein, **tau**, in the nerve cells, thereby slowing the formation of **tangles**. Phase III Clinical Trials are scheduled to begin in 2009. If they are successful, **Rember** could be available in 2012. Those suffering from AD—and their family members—look with hope to the near future for research breakthroughs that help to combat this devastating disease.

For more information about the stages of a clinical trial, please see Clinical Trial.gov (http://clinicaltrials.gov/)

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Times Online. (2008). *New Drug Rember Brings "Unprecedented" Alzheimer's Treatment Advance.* Retrieved 8/1/08 from http://www.timesonline.co.uk/tol/life_and_style/health/article4425218.ece.

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