Alzheimer disease

Alzheimer disease is a degenerative disease of the brain that causes dementia, which is a gradual loss of memory, judgment, and ability to function. This disorder usually appears in people older than age 65, but less common forms of the disease appear earlier in adulthood.

Memory loss is the most common sign of Alzheimer disease. Forgetfulness may be subtle at first, but the loss of memory worsens over time until it interferes with most aspects of daily living. Even in familiar settings, a person with Alzheimer disease may get lost or become confused. Routine tasks such as preparing meals, doing laundry, and performing other household chores can be challenging. Additionally, it may become difficult to recognize people and name objects. Affected people increasingly require help with dressing, eating, and personal care.

As the disorder progresses, some people with Alzheimer disease experience personality and behavioral changes and have trouble interacting in a socially appropriate manner. Other common symptoms include agitation, restlessness, withdrawal, and loss of language skills. People with this disease usually require total care during the advanced stages of the disease. Affected individuals usually survive 8 to 10 years after the appearance of symptoms, but the course of the disease can range from 1 to 25 years. Death usually results from pneumonia, malnutrition, or general body wasting (inanition).

Alzheimer disease can be classified as early-onset or late-onset. The signs and symptoms of the early-onset form appear before age 65, while the late-onset form appears after age 65. The early-onset form is much less common than the late-onset form, accounting for less than 5 percent of all cases of Alzheimer disease.

Frequency

Alzheimer disease currently affects an estimated 2.4 million to 4.5 million Americans. Because the risk of developing Alzheimer disease increases with age and more people are living longer, the number of people with this disease is expected to increase significantly in coming decades.

Causes

Most cases of early-onset Alzheimer disease are caused by gene mutations that can be passed from parent to child. Researchers have found that this form of the disorder can result from mutations in one of three genes: APP, PSEN1, or PSEN2. When any of these genes is altered, large amounts of a toxic protein fragment called amyloid beta peptide are produced in the brain. This peptide can build up in the brain to form clumps called amyloid plaques, which are characteristic of Alzheimer disease. A buildup of toxic
amyloid beta peptide and amyloid plaques may lead to the death of nerve cells and the progressive signs and symptoms of this disorder.

Some evidence indicates that people with Down syndrome have an increased risk of developing Alzheimer disease. Down syndrome, a condition characterized by intellectual disability and other health problems, occurs when a person is born with an extra copy of chromosome 21 in each cell. As a result, people with Down syndrome have three copies of many genes in each cell, including the \textit{APP} gene, instead of the usual two copies. Although the connection between Down syndrome and Alzheimer disease is unclear, the production of excess amyloid beta peptide in cells may account for the increased risk. People with Down syndrome account for less than 1 percent of all cases of Alzheimer disease.

The causes of late-onset Alzheimer disease are less clear. The late-onset form does not clearly run in families, although clusters of cases have been reported in some families. This disorder is probably related to variations in one or more genes in combination with lifestyle and environmental factors. A gene called \textit{APOE} has been studied extensively as a risk factor for the disease. In particular, a variant of this gene called the e4 allele seems to increase an individual's risk for developing late-onset Alzheimer disease. Researchers are investigating many additional genes that may play a role in Alzheimer disease risk.

**Inheritance Pattern**

The early-onset form of Alzheimer disease is inherited in an autosomal dominant pattern, which means one copy of the altered gene in each cell is sufficient to cause the disorder. In most cases, an affected person inherits the altered gene from one affected parent.

The inheritance pattern of late-onset Alzheimer disease is uncertain. People who inherit one copy of the \textit{APOE} e4 allele have an increased chance of developing the disease; those who inherit two copies of the allele are at even greater risk. It is important to note that people with the \textit{APOE} e4 allele inherit an increased risk of developing Alzheimer disease, not the disease itself. Not all people with Alzheimer disease have the e4 allele, and not all people who have the e4 allele will develop the disease.

**Other Names for This Condition**

- AD
- Alzheimer dementia (AD)
- Alzheimer sclerosis
- Alzheimer syndrome
- Alzheimer-type dementia (ATD)
- Alzheimer's Disease
- DAT
• familial Alzheimer disease (FAD)
• Presenile and senile dementia
• Primary Senile Degenerative Dementia
• SDAT

Diagnosis & Management

Formal Treatment/Management Guidelines

• American Psychiatric Association: Practice Guideline for the Treatment of Patients with Alzheimer's Disease and Other Dementias

Genetic Testing Information

• What is genetic testing?
  /primer/testing/genetictesting

• Genetic Testing Registry: Alzheimer disease 2

• Genetic Testing Registry: Alzheimer disease, type 3

• Genetic Testing Registry: Alzheimer disease, type 4

• Genetic Testing Registry: Alzheimer's disease

Research Studies from ClinicalTrials.gov

• ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22Alzheimer+disease%22

Other Diagnosis and Management Resources

• Alzheimer's Disease Research Center, Washington University School of Medicine
  https://knightadrc.wustl.edu/

• GeneReview: Alzheimer Disease Overview

• MedlinePlus Encyclopedia: Alzheimer's Disease
  https://medlineplus.gov/ency/article/000760.htm

• MedlinePlus Medical Tests: Cognitive Testing
  https://medlineplus.gov/lab-tests/cognitive-testing/
• Michigan Alzheimer’s Disease Research Center  
  https://alzheimers.med.umich.edu/

• University of California Davis Alzheimer's Disease Center  
  https://health.ucdavis.edu/alzheimers/

**Additional Information & Resources**

**Health Information from MedlinePlus**

• Encyclopedia: Alzheimer’s Disease  
  https://medlineplus.gov/ency/article/000760.htm

• Health Topic: Alzheimer's Caregivers  
  https://medlineplus.gov/alzheimerscaregivers.html

• Health Topic: Alzheimer's Disease  
  https://medlineplus.gov/alzheimersdisease.html

• Medical Tests: Cognitive Testing  
  https://medlineplus.gov/lab-tests/cognitive-testing/

**Genetic and Rare Diseases Information Center**

• Alzheimer disease  
  https://rarediseases.info.nih.gov/diseases/10254/alzheimer-disease

• Early-onset, autosomal dominant Alzheimer disease  

• Familial Alzheimer disease  

• Late-Onset Familial Alzheimer Disease  

**Additional NIH Resources**

• National Institute of Neurological Disorders and Stroke  
  https://www.ninds.nih.gov/Disorders/All-Disorders/Alzheimers-Disease-Information-Page

• National Institute on Aging: Alzheimer’s Disease Education and Referral Center  
  https://www.nia.nih.gov/health/alzheimers
• National Institute on Aging: Alzheimer’s Disease Genetics Fact Sheet  
https://www.nia.nih.gov/health/alzheimers-disease-genetics-fact-sheet

• NIH Press Release: Scientists Isolate a Toxic Key to Alzheimer's Disease in Human Brains (June 22, 2008)  

Educational Resources

• Emory University School of Medicine  
http://genetics.emory.edu/documents/resources/Emory_Human_Genetics_Family_History_Alzheimer_Disease.PDF

• Genetic Science Learning Center, University of Utah  
https://learn.genetics.utah.edu/content/disorders/multifactorial/

• Joseph and Kathleen Bryan Alzheimer's Disease Research Center, Duke University Medical Center  
https://neurology.duke.edu/research/research-centers/joseph-and-kathleen-bryan-alzheimers-disease-research-center-bryan-adrc

• MalaCards: alzheimer disease  
https://www.malacards.org/card/alzheimer_disease

• Merck Manual Consumer Version: Alzheimer Disease Quick Facts  

• Merck Manual Consumer Version: Overview of Delirium and Dementia  

• Orphanet: Early-onset autosomal dominant Alzheimer disease  
https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=1020

• Orphanet: NON RARE IN EUROPE: Alzheimer disease  
https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=238616

• Your Genes Your Health from Cold Spring Harbor Laboratory  
http://www.ygyh.org/alz/whatisit.htm

• Your Genome from Wellcome Genome Campus  
https://www.yourgenome.org/facts/what-is-alzheimers-disease

Patient Support and Advocacy Resources

• Alzheimer Research Forum  
https://www.alzforum.org/

• Alzheimer's Association  
https://www.alz.org/
• Alzheimer’s Foundation of America  https://alzfdn.org/
• Family Caregiver Alliance  https://www.caregiver.org/alzheimers-disease-caregiving

Clinical Information from GeneReviews
• Alzheimer Disease Overview  https://www.ncbi.nlm.nih.gov/books/NBK1161

Scientific Articles on PubMed
• PubMed  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Alzheimer+Disease%5BMAJR%5D%29+AND+%28%28Alzheimer+disease%5BTI%5D%29+OR+%28Alzheimer’s+disease%5BTI%5D%29+AND+review%5Bpt%5D+AND+english%5Blanguage%5D+AND+human%5Bbiomedia%5D%29+AND+%22last+180+days%22%5Bdate%5D

Catalog of Genes and Diseases from OMIM
• ALZHEIMER DISEASE  http://omim.org/entry/104300
• ALZHEIMER DISEASE 2  http://omim.org/entry/104310
• ALZHEIMER DISEASE 3  http://omim.org/entry/607822
• ALZHEIMER DISEASE 4  http://omim.org/entry/606889

Medical Genetics Database from MedGen

Sources for This Summary
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  Free article on PubMed Central:  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2690397/
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