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. Survival is usually shorter in individuals diagnosed after age 80 than in those diagnosed at a younger age. 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 between a person's thirties and mid-sixties, while the late-onset form appears during or after a person's mid-sixties. The early-onset form is much less common than the late-onset form, accounting for less than 10 percent of all cases of Alzheimer disease.

Frequency

Alzheimer disease currently affects more than 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

Some cases of early-onset Alzheimer disease are caused by gene mutations that can be passed from parent to child. This results in what is known as early-onset familial Alzheimer disease (FAD). Researchers have found that this form of the disorder can
result from mutations in the $\text{APP}$, $\text{PSEN1}$, or $\text{PSEN2}$ genes. 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. Other cases of early-onset Alzheimer disease may be associated with changes in different genes, some of which have not been identified.

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 $\text{APP}$ 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. This type of Alzheimer disease is not inherited.

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 $\text{APOE}$ 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.

Many more genes have been associated with Alzheimer disease, and researchers are investigating the role that additional genes may play in Alzheimer disease risk.

**Inheritance Pattern**

Early-onset familial Alzheimer disease is inherited in an autosomal dominant pattern, which means one copy of an 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 $\text{APOE}$ 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 $\text{APOE}$ 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

page 3
Other Diagnosis and Management Resources

- GeneReview: Alzheimer Disease Overview
- MedlinePlus Encyclopedia: Alzheimer's Disease
  https://medlineplus.gov/ency/article/000760.htm
  https://medlineplus.gov/lab-tests/cognitive-testing/
- National Institute on Aging: Alzheimer's Disease Research Centers
  https://www.nia.nih.gov/health/alzheimers-disease-research-centers
- Virginia Tech University: Gene Test or Not?
  https://genetestornot.org/

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
- National Institute on Aging: Alzheimer's Disease in People with Down Syndrome
- National Institute on Aging: Alzheimer's Disease Research Centers
  https://www.nia.nih.gov/health/alzheimers-disease-research-centers

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/
- MalaCards: alzheimer disease
  https://www.malacards.org/card/alzheimer_disease
- 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
- UsAgainstAlzheimers
  https://www.usagainstalzheimers.org/

Clinical Information from GeneReviews

- Alzheimer Disease Overview

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%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+180+days%22%5Bdp%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

- Alzheimer disease
Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/30704681

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/18414205
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2690397/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/29941717
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6032682/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/29614878

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17659183
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2735049/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16804026

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/23390181
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3719424/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/29714994

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/18086004

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/29956105
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6246849/

Reprinted from Genetics Home Reference: 

Reviewed: May 2019
Published: September 10, 2019