

# Alzheimer's Disease

## FACT SHEET

**A**lzheimer's disease (AD) is an irreversible, progressive brain disease that slowly destroys memory and thinking skills, and eventually even the ability to carry out the simplest tasks. In most people with AD, symptoms first appear after age 60.

AD is the most common cause of dementia among older people. Dementia is the loss of cognitive functioning—thinking, remembering, and reasoning—to such an extent that it interferes with a person's daily life and activities. According to recent estimates, as many as 2.4 to 4.5 million Americans are living with AD.

AD is named after Dr. Alois Alzheimer. In 1906, Dr. Alzheimer noticed changes in the brain tissue of a woman who had died of an unusual mental illness. Her symptoms included memory loss, language problems, and unpredictable behavior. After she died, he examined her brain and found many abnormal clumps (now called amyloid plaques) and tangled bundles of fibers (now called neurofibrillary tangles). Plaques and tangles in the brain are two of the main features of AD. The third is the loss of connections between nerve cells (neurons) in the brain.

### Changes in the Brain in AD

Although we still don't know what starts the AD process, we do know that damage to the brain begins as many as 10 to 20 years before any problems are evident. Tangles begin to develop deep in the brain, in an area called the entorhinal cortex, and plaques form in other areas. As more and more plaques and tangles form in particular brain areas, healthy neurons begin to work less efficiently. Then, they lose their ability to function and communicate with each other, and eventually they die. This damaging process spreads to a nearby structure, called the hippocampus, which is essential in forming memories. As the death of neurons increases, affected brain regions begin to shrink. By the final stage of AD, damage is widespread and brain tissue has shrunk significantly.

### Very Early Signs and Symptoms

Memory problems are one of the first signs of AD. Some people with memory problems have a condition called amnesic mild cognitive impairment (MCI). People with this condition have more memory problems than normal for people their age, but their symptoms



Alzheimer's Disease Education & Referral (ADEAR) Center  
A Service of the National Institute on Aging  
National Institutes of Health  
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are not as severe as those with AD. More people with MCI, compared with those without MCI, go on to develop AD.

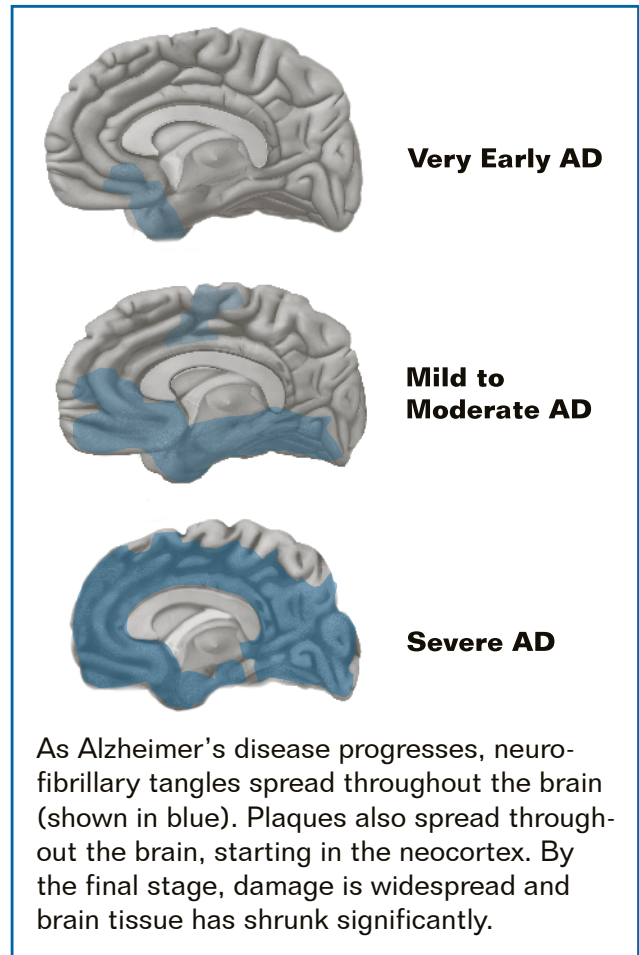
Other changes may also signal the very early stages of AD. For example, recent research has found links between some movement difficulties and MCI. Researchers also have seen links between some problems with the sense of smell and cognitive problems. Brain imaging and biomarker studies of people with MCI and those with a family history of AD are beginning to detect early changes in the brain like those seen in AD. These findings will need to be confirmed by other studies but appear promising. Such findings offer hope that some day, we may have tools that could help detect AD early, track the course of the disease, and monitor response to treatments.

### Mild AD

As AD progresses, memory loss continues and changes in other cognitive abilities appear. Problems can include getting lost, trouble handling money and paying bills, repeating questions, taking longer to complete normal daily tasks, poor judgment, and mood and personality changes. People often are first diagnosed in this stage.

### Moderate AD

In this stage, damage occurs in areas of the brain that control language, reasoning, sensory processing, and conscious thought. Memory loss and confusion increase, and people begin to have problems recognizing family and friends. They may be unable to learn new things, carry out tasks that involve multiple steps (such as getting dressed), or cope with new situations.



They may have hallucinations, delusions, and paranoia, and may behave impulsively.

### Severe AD

By the final stage, plaques and tangles have spread throughout the brain and brain tissue has shrunk significantly. People with severe AD cannot communicate and are completely dependent on others for their care. Near the end, the person may be in bed most or all of the time as the body shuts down.

## What Causes AD

Scientists don't yet fully understand what causes AD, but it is clear that it develops because of a complex series of events that

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take place in the brain over a long period of time. It is likely that the causes include genetic, environmental, and lifestyle factors. Because people differ in their genetic make-up and lifestyle, the importance of these factors for preventing or delaying AD differs from person to person.

## The Basics of AD

Scientists are conducting studies to learn more about plaques, tangles, and other features of AD. They can now visualize plaques by imaging the brains of living individuals. They are also exploring the very earliest steps in the disease process. Findings from these studies will help them understand the causes of AD.

One of the great mysteries of AD is why it largely strikes older adults. Research on how the brain changes normally with age is shedding light on this question. For example, scientists are learning how age-related changes in the brain may harm neurons and contribute to AD damage. These age-related changes include inflammation and the production of unstable molecules called free radicals.

## Genetics

In a very few families, people develop AD in their 30s, 40s, and 50s. These people have a mutation, or permanent change, in one of three genes that they inherited from a parent. We know that these gene mutations cause AD in these “early-onset” familial cases.

However, most people with AD have “late-onset” AD, which usually develops after age 60. Many studies have linked a

gene called APOE to late-onset AD. This gene has several forms. One of them, APOE  $\epsilon$ 4, increases a person’s risk of getting the disease. About 40 percent of all people who develop late-onset AD carry this gene. However, carrying the APOE  $\epsilon$ 4 form of the gene does not necessarily mean that a person will develop AD, and people carrying no APOE  $\epsilon$ 4 forms can also develop AD.

Scientists think that other risk-factor genes exist as well. A possible new one, SORL1, was discovered in 2007. Large-scale genetic research studies are looking to find other genes. For more about this area of research, see the *Alzheimer’s Disease Genetics Fact Sheet*, available at [www.nia.nih.gov/Alzheimers](http://www.nia.nih.gov/Alzheimers).

## Lifestyle Factors

A nutritious diet, exercise, social engagement, and mentally stimulating pursuits can all help people stay healthy. New research suggests the possibility that these factors also might help to reduce the risk of cognitive decline and AD. Scientists are investigating associations between cognitive decline and heart disease, high blood pressure, diabetes, and obesity. Understanding these relationships and testing them in clinical trials will help us understand whether reducing risk factors for these diseases may help with AD as well.

## How AD Is Diagnosed

AD can be definitively diagnosed only after death by linking clinical course with an examination of brain tissue and pathology in an autopsy. But doctors now have several methods and tools to help them determine fairly accurately

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whether a person who is having memory problems has “possible AD” (the symptoms may be due to another cause) or “probable AD” (no other cause for the symptoms can be found). To diagnose AD, doctors:

- ask questions about the person’s overall health, past medical problems, ability to carry out daily activities, and changes in behavior and personality
- conduct tests of memory, problem solving, attention, counting, and language
- carry out medical tests, such as tests of blood, urine, or spinal fluid
- perform brain scans, such as a computerized tomography (CT) scan or a magnetic resonance imaging (MRI) test

These tests may be repeated to give doctors information about how the person’s memory is changing over time.

Early diagnosis is beneficial for several reasons. Having an early diagnosis and starting treatment in the early stages of the disease can help preserve function for months to years, even though the underlying AD process cannot be changed. Having an early diagnosis also helps families plan for the future, make living arrangements, take care of financial and legal matters, and develop support networks.

In addition, an early diagnosis can provide greater opportunities for people to get involved in clinical trials. In a clinical trial, scientists test drugs or

treatments to see which are most effective and for whom they work best. (See the box, below, for more information.)

## **Participating in Clinical Trials**

People with AD, those with MCI, those with a family history of AD, and healthy people with no memory problems and no family history of AD may be able to take part in clinical trials. Study volunteers help scientists learn about the brain in healthy aging as well as what happens in AD. Results of AD clinical trials are used to improve prevention and treatment approaches. Participating in clinical trials is an effective way to help in the fight against AD.

NIA, which is part of the National Institutes of Health (NIH), leads the Federal Government’s research efforts on AD. NIA-supported Alzheimer’s Disease Centers located throughout the United States conduct many clinical trials and carry out a wide range of research, including studies of the causes, diagnosis, and management of AD. NIA also sponsors the Alzheimer’s Disease Cooperative Study (ADCS), a consortium of leading AD researchers throughout the U.S. and Canada who conduct clinical trials on promising AD treatments.

To find out more about AD clinical trials, talk to your health care provider or contact NIA’s ADEAR Center at 1-800-438-4380. Or, visit the ADEAR Center clinical trials database at [www.nia.nih.gov/Alzheimers/ResearchInformation/ClinicalTrials](http://www.nia.nih.gov/Alzheimers/ResearchInformation/ClinicalTrials). You also can sign up for email alerts that let you know when new clinical trials are added to the database. More information about clinical trials is available at [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov).

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## How AD Is Treated

AD is a complex disease, and no single “magic bullet” is likely to prevent or cure it. That’s why current treatments focus on several different aspects, including helping people maintain mental function; managing behavioral symptoms; and slowing, delaying, or preventing AD.

### Helping People with AD Maintain Mental Function

Four medications are approved by the U.S. Food and Drug Administration to treat AD. Donepezil (Aricept®), rivastigmine (Exelon®), and galantamine (Razadyne®) are used to treat mild to moderate AD (donepezil can be used for severe AD as well). Memantine (Namenda®) is used to treat moderate to severe AD. These drugs work by regulating neurotransmitters (the chemicals that transmit messages between neurons). They may help maintain thinking, memory, and speaking skills, and help with certain behavioral problems. However, these drugs don’t change the underlying disease process and may help only for a few months to a few years.

### Managing Behavioral Symptoms

Common behavioral symptoms of AD include sleeplessness, agitation, wandering, anxiety, anger, and depression. Scientists are learning why these symptoms occur and are studying new treatments—drug and non-drug—to manage them. Treating behavioral symptoms often makes people with AD more comfortable and makes their care easier for caregivers.

### Slowing, Delaying, or Preventing AD

AD research has developed to a point where scientists can look beyond treating

symptoms to think about addressing the underlying disease process. In ongoing AD clinical trials, scientists are looking at many possible interventions, such as cardiovascular treatments, antioxidants, immunization therapy, cognitive training, and physical activity.

## Supporting Families and Caregivers

Caring for a person with AD can have high physical, emotional, and financial costs. The demands of day-to-day care, changing family roles, and difficult decisions about placement in a care facility can be hard to handle. Researchers are learning a lot about AD caregiving, and studies are helping experts develop new ways to support caregivers.

Becoming well-informed about AD is one important long-term strategy. Programs that teach families about the various stages of AD and about flexible and practical strategies for dealing with difficult caregiving situations provide vital help to those who care for people with AD.

Developing good coping skills and a strong support network of family and friends also are important ways that caregivers can help themselves handle the stresses of caring for a loved one with AD. For example, staying physically active provides physical and emotional benefits.

Some AD caregivers have found that participating in an AD support group is a critical lifeline. These support groups allow caregivers to find respite, express concerns, share experiences, get tips, and receive emotional comfort. The Alzheimer’s Association, Alzheimer’s Disease Centers, and many other organizations sponsor

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in-person and online AD support groups across the country. There are a growing number of groups for people in the early stage of AD and their families. Support networks can be especially valuable when caregivers face the difficult decision of whether and when to place a loved one in a nursing home.

## **Advancing Our Understanding**

Thirty years ago, we knew very little about AD. Since then, scientists have made many important advances.

Research supported by NIA and other organizations has expanded knowledge of brain function in healthy older people, identified ways we might lessen normal age-related declines in mental function, and deepened our understanding of AD. Many scientific and clinical fields are now working together to untangle the genetic, biological, and environmental factors that, over many years, ultimately result in AD. This effort is bringing us closer to the day when we will be able to manage successfully or even prevent this devastating disease.

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## **For More Information**

To learn about support groups, services, research centers, research studies, and publications about AD, contact the following resources:

### **Alzheimer's Disease Education and Referral (ADEAR) Center**

P.O. Box 8250  
Silver Spring, MD 20907-8250  
800-438-4380 (toll-free)  
[www.nia.nih.gov/Alzheimers](http://www.nia.nih.gov/Alzheimers)

A service of the National Institute on Aging (NIA), the ADEAR Center offers information and publications for families, caregivers, and professionals on diagnosis, treatment, patient care, caregiver needs, long-term care, education and training, and research related to AD. Staff members answer telephone, email, and written requests and make referrals to local and national resources. The ADEAR website provides free, online publications in English and Spanish; email alert and online *Connections* newsletter subscriptions; an AD clinical

trials database; the AD Library database; and more.

### **Alzheimer's Association**

225 N. Michigan Avenue, Floor 17  
Chicago, IL 60601-7633  
800-272-3900 (toll-free)  
866-403-3073 (TDD/toll-free)  
[www.alz.org](http://www.alz.org)

### **Alzheimer's Foundation of America**

322 Eighth Avenue, 7th Floor  
New York, NY 10001  
866-AFA-8484 (866-232-8484; toll-free)  
[www.alzfdn.org](http://www.alzfdn.org)

### **Eldercare Locator**

800-677-1116 (toll-free)  
[www.eldercare.gov](http://www.eldercare.gov)

### **Family Caregiver Alliance**

180 Montgomery Street, Suite 1100  
San Francisco, CA 94104  
800-445-8106 (toll-free)  
[www.caregiver.org](http://www.caregiver.org)

### **NIH Senior Health**

[www.nihseniorhealth.gov](http://www.nihseniorhealth.gov)