

# Alzheimer's Disease



## FACT SHEET

### Learn About

- Alzheimer's and the Brain
- Signs and Symptoms
- Stages of Alzheimer's
- How is Alzheimer's Diagnosed?
- How is Alzheimer's Treated?
- Support for Families and Caregivers
- Finding More Resources

**A**lzheimer's disease is a brain disorder that slowly destroys memory and thinking skills, and, eventually, the ability to carry out the simplest tasks. In most people with Alzheimer's, symptoms first appear later in life.

Alzheimer's is a leading cause of death in the United States and is the most common cause of dementia among older adults. Estimates vary, but experts suggest that more than 6 million Americans, most of them age 65 or older, may have Alzheimer's.

Dementia is the loss of cognitive functioning — thinking, remembering, and reasoning — and behavioral abilities to such an extent that it interferes with a person's daily life and activities. Dementia ranges from the mildest stage, when it is just beginning to affect a person's functioning, to the most severe stage, when a person must depend completely on others for help with basic activities of daily living.

The causes of dementia vary depending on the types of brain changes that may be taking place. Other forms of dementia include Lewy body dementia,

frontotemporal disorders, and vascular dementia. It is common for people to have mixed dementia — a combination of two or more forms of dementia. For example, some people have both Alzheimer's and vascular dementia.

Alzheimer's disease 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 and tangled bundles of fibers. The abnormal clumps and tangled bundles of fibers were, respectively, buildups of the proteins amyloid and tau, which are now referred to as amyloid plaques and tau tangles.

These plaques and tangles in the brain are still considered some of the main features of Alzheimer's. Another feature is the loss of connections between neurons in the brain. Neurons transmit messages between different parts of the brain, and from the brain to muscles and organs in the body.

# Alzheimer's and the Brain

Scientists continue to unravel the complex brain changes involved in Alzheimer's. Changes in the brain may begin a decade or more before symptoms appear. During this very early stage of Alzheimer's, changes are taking place in the brain, including abnormal buildups of amyloid plaques and tau tangles. Previously healthy neurons stop working properly and eventually die, resulting in widespread loss of brain function. Many other complex brain changes are thought to play a role in Alzheimer's as well.

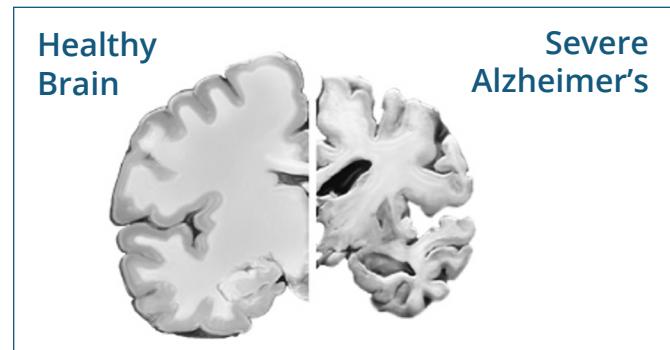
The damage to neurons initially appears to take place in the hippocampus and the entorhinal cortex, which are parts of the brain that are essential in forming memories. The disease later affects areas in the cerebral cortex responsible for language, reasoning, and social behavior. Eventually, many other areas of the brain and surrounding neurons are damaged and stop working normally. By the final stage of Alzheimer's, damage is widespread and brain tissue has shrunk significantly.

## Signs and Symptoms

Memory problems are typically one of the first signs of cognitive impairment related to Alzheimer's. Some people with memory problems have a condition called mild cognitive impairment (MCI). With MCI, people have more memory problems than normal for their age, but their symptoms do not interfere significantly with their everyday lives. Movement difficulties and problems with the sense of smell have also been linked to MCI. Older people with MCI are at greater risk for developing Alzheimer's, but not all of them do. Some may even regain their normal ability to think and remember.

The first symptoms of Alzheimer's vary from person to person. For many, decline in nonmemory aspects of cognition, such as word-finding, vision/spatial issues, and impaired reasoning or judgment, may signal the very early stages of the disease.

Researchers are studying biomarkers (biological signs of disease found in brain images, cerebrospinal fluid, and blood) to detect early changes in the brains of people with MCI and in cognitively normal people who may be at greater risk for Alzheimer's. More research is needed before these techniques can be used broadly and routinely to diagnose Alzheimer's in a health care provider's office.



## Stages of Alzheimer's

### Mild Alzheimer's Disease

As Alzheimer's worsens, people experience greater memory loss and other cognitive difficulties. Problems can include wandering and getting lost, having trouble handling money and paying bills, repeating questions, taking longer to complete normal daily tasks, and developing personality and behavior changes. People are often diagnosed in this stage.

### Moderate Alzheimer's Disease

In this stage, damage occurs in areas of the brain that control language, reasoning, conscious thought, and sensory processing, such as the ability to correctly detect sounds and smells.

Memory loss and confusion grow worse, and people begin to have problems recognizing family and friends. They may be unable to learn new things, carry out multistep tasks such as getting dressed, or cope with new situations. In addition, people at this stage may have hallucinations, delusions, and paranoia, and may behave impulsively.

## Severe Alzheimer's Disease

Ultimately, damage to the brain becomes so widespread with severe Alzheimer's that a person cannot communicate and is completely dependent on others for their care. Near the end of life, the person may be in bed most or all of the time as the body shuts down.

## What Causes Alzheimer's?

In recent years, scientists have made tremendous progress in understanding Alzheimer's, and the momentum continues to grow. Still, scientists don't yet fully understand what causes Alzheimer's in most people. The causes probably include a combination of genetic, environmental, and lifestyle factors. The importance of any one of these factors in increasing or decreasing the risk of developing Alzheimer's may differ from person to person.

## The Basics of Alzheimer's

Scientists are conducting studies to learn more about plaques, tangles, and other biological features of Alzheimer's. Advances in brain imaging techniques allow researchers to see the development and spread of abnormal amyloid and tau proteins in the living brain, as well as changes in brain structure and function. Scientists are also exploring the very earliest steps in the disease process by studying changes in the brain and body

fluids that can be detected years before Alzheimer's symptoms appear. Findings from these studies will help in understanding the causes of Alzheimer's and make diagnosis easier.



**Neurons in the brain with amyloid plaques and tau tangles**

One of the great mysteries of Alzheimer's is why it largely affects older adults. Research on normal brain aging is exploring this question. For example, scientists are learning how age-related changes in the brain may harm neurons and affect other types of brain cells to contribute to Alzheimer's damage. These age-related changes include atrophy (shrinking) of certain parts of the brain, inflammation, blood vessel damage, production of unstable molecules called free radicals, and mitochondrial dysfunction (a breakdown of energy production within a cell).

## Alzheimer's Genetics

In most cases, Alzheimer's does not have a single genetic cause. Instead, it is likely influenced by multiple genes in combination with lifestyle and environmental factors. Changes in genes, called genetic variants, may increase or decrease a person's risk of developing the disease.

Scientists have identified multiple genetic regions associated with Alzheimer's. Of the genetic variants associated with Alzheimer's so far, only three are known to cause the disease. Although it happens rarely, when someone inherits an altered version of one of these genes — *APP*, *PSEN1*, or *PSEN2* — they will likely develop Alzheimer's before age 65 and sometimes much earlier.

People with Down syndrome also have a higher risk of developing Alzheimer's earlier in life. Down syndrome results from having an extra chromosome 21, which carries the *APP* gene that produces the amyloid precursor protein. Too much of this protein leads to buildup of beta-amyloid plaques in the brain. Estimates suggest that 50% or more of people living with Down syndrome will develop Alzheimer's, with symptoms appearing in their 50s and 60s.

Variations in the apolipoprotein *E* (*APOE*) gene are also known to influence Alzheimer's risk. This gene has several forms. Specifically, *APOE ε4* increases a person's risk of developing Alzheimer's and is also associated with developing Alzheimer's earlier in life for certain populations. *APOE ε2* may provide some protection against Alzheimer's.

Changes in different genes, along with biomedical, lifestyle, and environmental factors, play a role in a person potentially developing Alzheimer's. Still, it is not known for certain if any individual will or will not develop the disease.

For more about Alzheimer's genetics research, see NIA's Alzheimer's Disease Genetics Fact Sheet at [www.nia.nih.gov/alzheimers-genes](http://www.nia.nih.gov/alzheimers-genes).

## Health, Environmental, and Lifestyle Factors

Research suggests that a host of factors beyond genetics may play a role in the development and course of Alzheimer's. There is a great deal of interest, for example, in the relationship between cognitive decline and vascular conditions such as heart disease, stroke, and high blood pressure, as well as diseases such as diabetes and obesity. Ongoing research will help us understand whether and how reducing risk factors for these conditions and diseases may also reduce the risk of Alzheimer's.

A nutritious diet, physical activity, social engagement, and mentally stimulating pursuits have all been associated with helping people stay healthy as they age. These factors might also help reduce the risk of cognitive decline and Alzheimer's. Researchers are testing some of these possibilities in clinical trials.

## How Is Alzheimer's Diagnosed?

Doctors use several methods and tools to help determine whether a person who is having memory problems has Alzheimer's.

To diagnose Alzheimer's, doctors may:

- Ask the person and a family member or friend questions about overall health, use of prescription and over-the-counter medicines, diet, 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.

- Order blood, urine, and other standard medical tests to help identify other possible causes of the problem.
- Administer tests to determine if depression or another mental health condition is causing or contributing to a person's symptoms.
- Collect cerebrospinal fluid by spinal tap or order blood tests to measure the levels of proteins associated with Alzheimer's and some related dementias.
- Perform brain scans, such as CT, MRI, or PET (positron emission tomography), to support an Alzheimer's diagnosis or to rule out other possible causes for symptoms.

These tests may be repeated to give doctors information about how the person's memory and other cognitive functions are changing over time.

People with memory and thinking concerns should talk to their doctor to

find out whether their symptoms are due to Alzheimer's or another cause, such as stroke, tumor, Parkinson's disease, sleep disturbances, side effects of medication, an infection, or another type of dementia. Some of these conditions may be treatable and possibly reversible.

If the diagnosis is Alzheimer's, beginning treatment as early as possible in the disease process could help preserve daily functioning for a while. An early diagnosis can also help families plan for the future. They may be able to take care of financial and legal matters, address potential safety issues, learn about living arrangements, and develop support networks.

In addition, an early diagnosis provides people with more opportunities to participate in clinical trials or other research studies testing possible new treatments for Alzheimer's.

For more information about how Alzheimer's is diagnosed, visit [www.nia.nih.gov/alzheimers-diagnosis](http://www.nia.nih.gov/alzheimers-diagnosis).



## Participating in Alzheimer's Clinical Trials and Studies

Everybody — those with Alzheimer's or MCI as well as healthy volunteers with or without a family history of Alzheimer's — may be able to take part in clinical trials and studies. Participants in Alzheimer's clinical research help scientists learn how the brain changes in healthy aging and in Alzheimer's.

Many volunteers are needed to participate in the hundreds of active clinical trials and studies that are testing ways to understand, diagnose, treat, and prevent Alzheimer's. Studies need participants of different ages, sexes, races, and ethnicities to ensure that results are meaningful for many people.

NIA leads the federal government's research efforts on Alzheimer's. NIA-funded Alzheimer's Disease Research Centers throughout the United States conduct a wide range of research, including studies of the causes, diagnosis, and management of the disease. NIA also sponsors the Alzheimer's Clinical Trials Consortium, which is designed to accelerate and expand studies and therapies in Alzheimer's and related dementias.

### To learn more about Alzheimer's clinical trials and studies:

- Talk to your health care provider about local studies that may be right for you.
- Contact Alzheimer's Disease Research Centers in your area at [www.nia.nih.gov/health/adrc](http://www.nia.nih.gov/health/adrc).
- Visit the Alzheimers.gov Clinical Trials Finder at [www.alzheimers.gov/clinical-trials](http://www.alzheimers.gov/clinical-trials) to learn about participating in Alzheimer's research, search for a trial near you, and watch videos of participants talking about their experiences.
- Sign up for email alerts about new trials at [www.nia.nih.gov/about/stay-connected](http://www.nia.nih.gov/about/stay-connected).
- Sign up for a registry or matching service to be invited to participate in studies at [www.nia.nih.gov/registries-matching-services](http://www.nia.nih.gov/registries-matching-services).

Learn more about participating in clinical trials at [www.nia.nih.gov/health/clinical-trials](http://www.nia.nih.gov/health/clinical-trials).

## How Is Alzheimer's Treated?

Alzheimer's is complex, and it is therefore unlikely that any one drug or other intervention will successfully treat it in all people living with the disease. In ongoing clinical trials, scientists are developing and testing several possible treatment interventions.

While there is currently no cure for Alzheimer's, medications are emerging to treat the progression of the disease. There are also medications that may temporarily improve or stabilize memory and thinking skills in some people and may help manage certain symptoms and behavioral problems.

Additionally, people with Alzheimer's may experience sleeplessness, depression, anxiety, agitation, and other behavioral and psychological symptoms. Scientists continue to research why these symptoms occur and are exploring new medications and nondrug strategies to manage them. Research shows that treating these symptoms may make people with Alzheimer's feel more comfortable and also help their caregivers. It's important to talk with a doctor about what treatment options may be most effective in your situation.

For more information about how Alzheimer's is treated, visit [www.nia.nih.gov/alzheimers-treatment](http://www.nia.nih.gov/alzheimers-treatment).

## Support for Families and Caregivers

Caring for a person with Alzheimer's can have significant physical, emotional, and financial costs. The demands of day-to-day care, changes in family roles, and decisions about placement in a care facility can be difficult. NIA supports efforts to develop programs, strategies, approaches, and other research to improve the quality of

care and life for those living with dementia and their caregivers.

Becoming well-informed about the disease is an important long-term strategy. Programs that teach families about the various stages of Alzheimer's and about ways to deal with difficult behaviors and other caregiving challenges can help.

Good coping skills, a strong support network, and respite care are other things that may help caregivers handle the stress of caring for a loved one with Alzheimer's. For example, staying physically active provides physical and emotional benefits.

Some caregivers have found that joining a support group is a critical lifeline. These support groups enable caregivers to find respite, express concerns, share experiences, get tips, and receive emotional comfort. Many organizations sponsor in-person and online support groups, including groups for people with early-stage Alzheimer's and their families.

For more information about Alzheimer's caregiving, visit [www.nia.nih.gov/alzheimers-care](http://www.nia.nih.gov/alzheimers-care).



# For More Information About Alzheimer's Disease

**NIA Alzheimer's and related Dementias Education and Referral (ADEAR) Center**  
800-438-4380  
[adear@nia.nih.gov](mailto:adear@nia.nih.gov)  
[www.nia.nih.gov/alzheimers](http://www.nia.nih.gov/alzheimers)

The NIA ADEAR Center offers information and free print publications about Alzheimer's and related dementias, for families, caregivers, and health professionals. ADEAR Center staff answer telephone, email, and written requests and make referrals to local and national resources.

**Alzheimers.gov**  
[www.alzheimers.gov](http://www.alzheimers.gov)

Visit Alzheimers.gov for information and resources on Alzheimer's and related dementias from across the federal government.

## Eldercare Locator

800-677-1116  
[eldercarelocator@USAging.org](mailto:eldercarelocator@USAging.org)  
<https://eldercare.acl.gov>

## MedlinePlus

National Library of Medicine  
[www.medlineplus.gov](http://www.medlineplus.gov)

## Alzheimer's Association

800-272-3900  
[info@alz.org](mailto:info@alz.org)  
[www.alz.org](http://www.alz.org)

**Alzheimer's Foundation of America**  
866-232-8484  
[info@alzfdn.org](mailto:info@alzfdn.org)  
<https://alzfdn.org>

**Family Caregiver Alliance**  
800-445-8106  
[www.caregiver.org/contact](http://www.caregiver.org/contact)  
[www.caregiver.org](http://www.caregiver.org)



National Institutes of Health

NIH Publication No. 24-AG-6423 | April 2024

National Institute on Aging

National Institutes of Health  
*NIH...Turning Discovery Into Health®*

U.S. Department of Health and Human Services