Overview of Alzheimer’s Disease

Alzheimer's disease is a progressive disorder that causes brain cells to waste away (degenerate) and die. Alzheimer's disease is the most common cause of dementia — a continuous decline in thinking, behavioral and social skills that disrupts a person's ability to function independently.

The early signs of the disease may be forgetting recent events or conversations. As the disease progresses, a person with Alzheimer's disease will develop severe memory impairment and lose the ability to carry out everyday tasks.

Current Alzheimer's disease medications may temporarily improve symptoms or slow the rate of decline. These treatments can sometimes help people with Alzheimer's disease maximize function and maintain independence for a time. Different programs and services can help support people with Alzheimer's disease and their caregivers.

There is no treatment that cures Alzheimer's disease or alters the disease process in the brain. In advanced stages of the disease, complications from severe loss of brain function — such as dehydration, malnutrition or infection — result in death.

Symptoms

Memory loss is the key symptom of Alzheimer's disease. An early sign of the disease is usually difficulty remembering recent events or conversations. As the disease progresses, memory impairments worsen and other symptoms develop.

At first, a person with Alzheimer's disease may be aware of having difficulty with remembering things and organizing thoughts. A family member or friend may be more likely to notice how the symptoms worsen.

Brain changes associated with Alzheimer's disease lead to growing trouble with:

Memory

Everyone has occasional memory lapses. It's normal to lose track of where you put your keys or forget the name of an acquaintance. But the memory loss associated with Alzheimer's disease persists and worsens, affecting the ability to function at work or at home.

People with Alzheimer's may:

- Repeat statements and questions over and over
- Forget conversations, appointments or events, and not remember them later

- Routinely misplace possessions, often putting them in illogical locations
- Get lost in familiar places
- Eventually forget the names of family members and everyday objects
- Have trouble finding the right words to identify objects, express thoughts or take part in conversations

Thinking and reasoning

Alzheimer's disease causes difficulty concentrating and thinking, especially about abstract concepts such as numbers.

Multitasking is especially difficult, and it may be challenging to manage finances, balance checkbooks and pay bills on time. These difficulties may progress to an inability to recognize and deal with numbers.

Making judgments and decisions

The ability to make reasonable decisions and judgments in everyday situations will decline. For example, a person may make poor or uncharacteristic choices in social interactions or wear clothes that are inappropriate for the weather. It may be more difficult to respond effectively to everyday problems, such as food burning on the stove or unexpected driving situations.

Planning and performing familiar tasks

Once-routine activities that require sequential steps, such as planning and cooking a meal or playing a favorite game, become a struggle as the disease progresses. Eventually, people with advanced Alzheimer's may forget how to perform basic tasks such as dressing and bathing.

Changes in personality and behavior

Brain changes that occur in Alzheimer's disease can affect moods and behaviors. Problems may include the following:

- Depression
- Apathy
- Social withdrawal
- Mood swings
- Distrust in others
- Irritability and aggressiveness

- Changes in sleeping habits
- Wandering
- Loss of inhibitions
- Delusions, such as believing something has been stolen

Preserved skills

Many important skills are preserved for longer periods even while symptoms worsen. Preserved skills may include reading or listening to books, telling stories and reminiscing, singing, listening to music, dancing, drawing, or doing crafts.

These skills may be preserved longer because they are controlled by parts of the brain affected later in the course of the disease.

When to see a doctor

A number of conditions, including treatable conditions, can result in memory loss or other dementia symptoms. If you are concerned about your memory or other thinking skills, talk to your doctor for a thorough assessment and diagnosis.

If you are concerned about thinking skills you observe in a family member or friend, talk about your concerns and ask about going together to a doctor's appointment.

Scientists believe that for most people, Alzheimer's disease is caused by a combination of genetic, lifestyle and environmental factors that affect the brain over time.

Less than 1 percent of the

time, Alzheimer's is caused by specific genetic changes that virtually guarantee a person will develop the disease. These rare occurrences usually result in disease onset in middle age.

The exact causes of Alzheimer's disease aren't fully understood, but at its core are problems with brain proteins that fail to function normally, disrupt the work of brain cells (neurons) and unleash a series of toxic events. Neurons are damaged, lose connections to each other and eventually die.

The damage most often starts in the region of the brain that controls memory, but the process begins years before the first symptoms. The loss of neurons spreads in a somewhat predictable pattern to other regions of the brains. By the late stage of the disease, the brain has shrunk significantly.

Researchers are focused on the role of two proteins:

- **Plaques.** Beta-amyloid is a leftover fragment of a larger protein. When these fragments cluster together, they appear to have a toxic effect on neurons and to disrupt cell-to-cell communication. These clusters form larger deposits called amyloid plaques, which also include other cellular debris.
- **Tangles.** Tau proteins play a part in a neuron's internal support and transport system to carry nutrients and other essential materials. In Alzheimer's disease, tau proteins change shape and organize themselves into structures called neurofibrillary tangles. The tangles disrupt the transport system and are toxic to cells.

Risk factors

Age

Increasing age is the greatest known risk factor for Alzheimer's disease. Alzheimer's is not a part of normal aging, but as you grow older the likelihood of developing Alzheimer's disease increases.

One study, for example, found that annually there were two new diagnoses per 1,000 people ages 65 to 74, 11 new diagnoses per 1,000 people ages 75 to 84, and 37 new diagnoses per 1,000 people age 85 and older.

Family history and genetics

Your risk of developing Alzheimer's is somewhat higher if a first-degree relative — your parent or sibling — has the disease. Most genetic mechanisms of Alzheimer's among families remain largely unexplained, and the genetic factors are likely complex.

One better understood genetic factor is a form of the apolipoprotein E gene (APOE). A variation of the gene, APOE e4, increases the risk of Alzheimer's disease, but not everyone with this variation of the gene develops the disease.

Scientists have identified rare changes (mutations) in three genes that virtually guarantee a person who inherits one of them will develop Alzheimer's. But these mutations account for less than 1 percent of people with Alzheimer's disease.

Down syndrome

Many people with Down syndrome develop Alzheimer's disease. This is likely related to having three copies of chromosome 21 — and subsequently three copies of the gene for the protein that leads to the creation of beta-amyloid. Signs and symptoms of Alzheimer's tend to appear 10 to 20 years earlier in people with Down syndrome than they do for the general population.

Sex

There appears to be little difference in risk between men and women, but, overall, there are more women with the disease because they generally live longer than men.

Mild cognitive impairment

Mild cognitive impairment (MCI) is a decline in memory or other thinking skills that is greater than what would be expected for a person's age, but the decline doesn't prevent a person from functioning in social or work environments.

People who have MCI have a significant risk of developing dementia. When the primary MCI deficit is memory, the condition is more likely to progress to dementia due to Alzheimer's disease. A diagnosis of MCI enables the person to focus on healthy lifestyle changes, develop strategies to compensate for memory loss and schedule regular doctor appointments to monitor symptoms.

Past head trauma

People who've had a severe head trauma have a greater risk of Alzheimer's disease.

Poor sleep patterns

Research has shown that poor sleep patterns, such as difficulty falling asleep or staying asleep, are associated with an increased risk of Alzheimer's disease.

Lifestyle and heart health

Research has shown that the same risk factors associated with heart disease may also increase the risk of Alzheimer's disease. These include:

- Lack of exercise
- Obesity
- Smoking or exposure to secondhand smoke
- High blood pressure
- High cholesterol
- Poorly controlled type 2 diabetes

These factors can all be modified. Therefore, changing lifestyle habits can to some degree alter your risk. For example, regular exercise and a healthy low-fat diet rich in fruits and vegetables are associated with a decreased risk of developing Alzheimer's disease.

Lifelong learning and social engagement

Studies have found an association between lifelong involvement in mentally and socially stimulating activities and a reduced risk of Alzheimer's disease. Low education levels — less than a high school education — appear to be a risk factor for Alzheimer's disease.

Complications

Memory and language loss, impaired judgment, and other cognitive changes caused by Alzheimer's can complicate treatment for other health conditions. A person with Alzheimer's disease may not be able to:

- Communicate that he or she is experiencing pain — for example, from a dental problem
- Report symptoms of another illness
- Follow a prescribed treatment plan
- Notice or describe medication side effects

As Alzheimer's disease progresses to its last stages, brain changes begin to affect physical functions, such as swallowing, balance, and bowel and bladder control. These effects can increase vulnerability to additional health problems such as:

- Inhaling food or liquid into the lungs (aspiration)
- Pneumonia and other infections

- Falls
- Fractures
- Bedsores
- Malnutrition or dehydration

Prevention

Alzheimer's disease is not a preventable condition. However, a number of lifestyle risk factors for Alzheimer's can be modified. Evidence suggests that changes in diet, exercise and habits — steps to reduce the risk of cardiovascular disease — may also lower your risk of developing Alzheimer's disease and other disorders that cause dementia. Heart-healthy lifestyle choices that may reduce the risk of Alzheimer's include the following:

- Exercise regularly
- Eat a diet of fresh produce, healthy oils and foods low in saturated fat
- Follow treatment guidelines to manage high blood pressure, diabetes and high cholesterol
- If you smoke, ask your doctor for help to quit smoking

Studies have shown that preserved thinking skills later in life and a reduced risk of Alzheimer's disease are associated with participating in social events, reading, dancing, playing board games, creating art, playing an instrument, and other activities that require mental and social engagement.

Diagnosis

A key component of a diagnostic assessment is self-reporting about symptoms, as well as the information that a close family member or friend can provide about symptoms and their impact on daily life. Additionally, a diagnosis of Alzheimer's disease is based on tests your doctor administers to assess memory and thinking skills.

Laboratory and imaging tests can rule out other potential causes or help the doctor better characterize the disease causing dementia symptoms.

The entire set of diagnostic tools is designed to detect dementia and determine with relatively high accuracy whether Alzheimer's disease or another condition is the cause. Alzheimer's disease can be diagnosed with complete certainty after death, when microscopic examination of the brain reveals the characteristic plaques and tangles.

Tests

A diagnostic work-up would likely include the following tests:

Physical and neurological exam

Your doctor will perform a physical exam and likely assess overall neurological health by testing the following:

- Reflexes
- Muscle tone and strength
- Ability to get up from a chair and walk across the room
- Sense of sight and hearing
- Coordination
- Balance

Lab tests

Blood tests may help your doctor rule out other potential causes of memory loss and confusion, such as a thyroid disorder or vitamin deficiencies.

Mental status and neuropsychological testing

Your doctor may conduct a brief mental status test or a more extensive set of tests to assess memory and other thinking skills. Longer forms of neuropsychological testing may provide additional details about mental function compared with people of a similar age and education level. These tests are also important for establishing a starting point to track the progression of symptoms in the future.

Brain imaging

Images of the brain are now used chiefly to pinpoint visible abnormalities related to conditions other than Alzheimer's disease — such as strokes, trauma or tumors — that may cause cognitive change. New imaging applications — currently used primarily in major medical centers or in clinical trials — may enable doctors to detect specific brain changes caused by Alzheimer's.

Imaging of brain structures include the following:

- **Magnetic resonance imaging (MRI).** MRI uses radio waves and a strong magnetic field to produce detailed images of the brain. MRI scans are used primarily to rule out other conditions. While they may show brain shrinkage, the information doesn't currently add significant value to making a diagnosis.
- **Computerized tomography (CT).** A CT scan, a specialized X-ray technology, produces cross-sectional images (slices) of your brain. It's currently used chiefly to rule out tumors, strokes and head injuries.

Imaging of disease processes can be performed with positron emission tomography (PET). During a PET scan, a low-level radioactive tracer is injected into the blood to reveal a particular feature in the brain. PET imaging may include the following:

- **Fluorodeoxyglucose (FDG) PET** scans show areas of the brain in which nutrients are poorly metabolized. Identifying patterns of degeneration — areas of low metabolism — can help distinguish between Alzheimer's disease and other types of dementia.
- **Amyloid PET imaging** can measure the burden of amyloid deposits in the brain. This imaging is primarily used in research but may be used if a person has unusual or very early onset of dementia symptoms.
- **Tau Pet imaging,** which measures the burden of neurofibrillary tangles in the brain, is only used in research.

In special circumstances, such as rapidly progressive dementia or very early onset dementia, other tests may be used to measure abnormal beta-amyloid or tau in the cerebrospinal fluid.

Future diagnostic tests

Researchers are working on tests that can measure the biological evidence of disease processes in the brain. These tests may improve the accuracy of diagnoses and enable earlier diagnosis before the onset of symptoms.

Genetic testing generally isn't recommended for a routine Alzheimer's disease evaluation. The exception is people who have a family history of early-onset Alzheimer's disease. Meeting with a genetic counselor to discuss the risks and benefits of genetic testing is recommended before undergoing any tests.