

## Creutzfeldt-Jakob Disease (CJD)

A topic in the Alzheimer's Association series on understanding dementia.

### About Dementia

Dementia is a condition in which a person has significant difficulty with daily functioning because of problems with thinking and memory. Dementia is not a single disease. It's an overall term — like “heart disease” — that covers a wide range of specific medical conditions, including Alzheimer's disease. Disorders grouped under the general term “dementia” are caused by abnormal brain changes. These changes trigger a decline in thinking skills severe enough to impair daily life and independent function. They also affect behavior, feelings and relationships.

Brain changes that cause dementia may be temporary, but they are most often permanent and worsen over time, leading to increasing disability and a shortened lifespan. Survival can vary widely, depending on such factors as the cause of the dementia, age at diagnosis and coexisting health conditions.

### Creutzfeldt-Jakob Disease (CJD)

Creutzfeldt-Jakob disease (abbreviated CJD and pronounced *CROYZ-felt YAH-cob*) is the most common human form of a group of rare, fatal brain disorders affecting people and certain other mammals. These disorders are known as prion (PREE-awn) diseases. They occur when prion protein, which is found throughout the body but whose normal function isn't yet known, begins folding into an abnormal three-dimensional shape. This shape change gradually triggers prion protein in the brain to fold into the same abnormal shape.

Through a process scientists don't yet understand, misfolded prion protein destroys brain cells. Resulting damage leads to rapid decline in thinking and reasoning as well as involuntary muscle movements, confusion, difficulty walking, and mood changes.

CJD causes a type of dementia that gets worse unusually fast. More common causes of dementia, such as Alzheimer's disease, dementia with Lewy bodies and frontotemporal dementia, typically progress more slowly.

An especially rare form of CJD can sometimes be transmitted like an infection from one person to another, from one animal to another or from certain animals to people. As a result of this infectious capability, prion diseases are also known as “transmissible spongiform encephalopathies.”

Many scientists suspect that some molecular processes driving abnormal protein folding in rare prion diseases may also play a role in more common disorders involving brain protein abnormalities, including Alzheimer's disease.

## Prevalence

CJD is rare, occurring in about 1 in 1 million people annually worldwide. In the United States, this translates to about 300 new cases each year.

Experts generally recognize the following main types of CJD:

- **Sporadic CJD** develops spontaneously for no known reason. It accounts for 85 percent of cases. On average, sporadic CJD first appears between ages 60 and 65.
- **Familial CJD** is caused by certain changes in the chromosome 20 gene coding the biological blueprint for prion protein. These genetic changes are “dominant,” meaning that anyone who inherits a CJD gene from an affected parent will also develop the disorder. Familial CJD accounts for about 10 to 15 percent of cases. It develops, on average, at a younger age than sporadic CJD, with some genetic types appearing as early as ages 20 to 40.
- **Infectious CJD** results from exposure to an external source of abnormal prion protein. These sources are estimated to account for about 1 percent of CJD cases. The two most common outside sources are:
  1. **Medical procedures** involving instruments used in neurosurgery, growth hormone from human sources or certain transplanted human tissues, including corneas (the clear outer covering of the eye) and dura mater (the fibrous membrane covering the brain and spinal cord). The risk of CJD from medical procedures has been greatly reduced by improved neurosurgical instrument sterilization techniques, new single-use instruments and synthetic sources of growth hormone and dura mater.
  2. **Meat or other products from cattle infected with bovine spongiform encephalopathy (“mad cow disease”)**, recognized in the mid-1990s as the cause of variant CJD (vCJD). Scientists traced this new type of CJD to consumption of beef from cattle whose feed included processed brain tissue from other animals. Since then, experts have diagnosed about 200 cases of vCJD, primarily in the United Kingdom and other European countries. Variant CJD tends to occur at a younger age than sporadic or familial forms, sometimes even in teenagers. New cases of vCJD have slowed significantly since 2000, most likely due to changes in animal feeding practices.

**Chronic wasting disease** is a prion disease similar to mad cow disease that’s been found in wild deer, elk and moose in certain U.S. states and Canadian provinces. According to the U.S. Centers for Disease Control and Prevention (CDC), there’s no evidence to date that chronic wasting disease has been transmitted to humans, including hunters who eat meat from affected animals. There’s also no evidence that rates of CJD have increased in states or provinces where chronic wasting disease has been identified. Additional studies are under way to understand what risk, if any, chronic wasting disease poses to humans. The CDC recommends that hunters who plan to eat meat from deer, elk or moose in areas where chronic wasting disease occurs consider having the meat tested by their local state wildlife agency. The CDC

also recommends wearing gloves while field-dressing these animals and to avoid handling the brain or spinal column.

## Symptoms

Specific CJD symptoms experienced by an individual and the order in which they appear can differ significantly. Some common symptoms include depression, agitation, apathy and mood swings; rapidly worsening confusion, disorientation, and problems with memory, thinking, planning and judgment; difficulty walking; and muscle stiffness, twitches and involuntary jerky movements.

## Diagnosis

There is no single test — or any combination of tests — that can conclusively diagnose sporadic CJD in a living person. Rapid symptom progression is one of the most important clues that a person may have CJD. The following tests may help determine whether an individual has CJD, especially if more than one test is consistent with CJD:

- **Electroencephalogram (EEG)**, which measures the brain's patterns of electrical activity similar to the way an electrocardiogram (ECG) measures the heart's electrical activity.
- **Brain magnetic resonance imaging (MRI)**, which can detect certain brain changes consistent with CJD.
- **Lumbar puncture (spinal tap)** to test cerebrospinal fluid (CSF) for the presence of certain proteins.

## Causes and Risk Factors

Sporadic CJD has no known cause. Most scientists believe the disease begins when prion protein somewhere in the brain spontaneously misfolds, triggering a “domino effect” that misfolds prion protein throughout the brain. Genetic variation in the prion protein gene at a location called “codon 129” may increase risk of this spontaneous misfolding.

Variation at codon 129 in the prion protein gene may also play a yet-to-be-determined role in making people susceptible to infectious CJD from external sources. Scientists don't yet know why infectious CJD seems to be transmitted through such a limited number of external sources. Researchers have found no evidence that the abnormal protein is commonly transmitted through sexual activity or blood transfusions, although a few cases of vCJD seem to have been spread through blood transfusions. Professionals such as surgeons, pathologists or butchers have not been shown to have a higher-than-normal risk through occupational exposure.

Familial CJD is caused by variations in the prion protein gene that guarantee an individual will develop CJD. Researchers have identified more than 50 prion protein mutations in those with inherited CJD. Genetic testing can determine whether family members at risk have inherited a CJD-causing mutation. Experts strongly recommend professional genetic counseling both before and after genetic testing for hereditary CJD.

## **Outcomes**

CJD progresses rapidly. Those affected lose their ability to move or speak and require full-time care to meet their daily needs. An estimated 90 percent of those diagnosed with sporadic CJD die within one year. Those affected by familial CJD tend to develop the disorder at an earlier age and survive somewhat longer than those with the sporadic form, as do those diagnosed with vCJD. Scientists have not yet learned the reason for these differences in survival.

## **Treatment**

There is no treatment that can slow or stop the underlying brain cell destruction caused by CJD and other prion diseases. Various drugs have been tested but have not shown any benefit. Clinical studies of potential CJD treatments are complicated by the rarity of the disease and its rapid progression.

Current therapies focus on treating symptoms and on supporting individuals and families coping with CJD. Doctors may prescribe painkillers such as opiates to treat pain if it occurs. Muscle stiffness and twitching may be treated with muscle-relaxing medications or antiseizure drugs. In the later stages of the disease, individuals with CJD become completely dependent on others for their daily needs and comfort.

## **Learn More**

For more information about CJD and other topics in the Alzheimer's Association series on understanding dementia, visit [www.alz.org](http://www.alz.org), or call our toll-free, 24/7 Helpline at 800.272.3900.

The Alzheimer's Association is the world's leading voluntary health organization in Alzheimer's care, support and research.