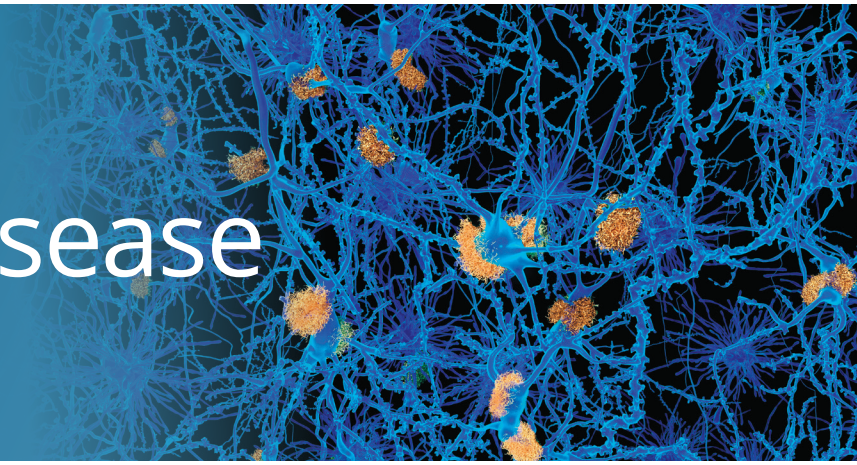
# Diet and Alzheimer's Disease



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Alzheimer's disease (AD) is a type of dementia that generally affects adults 65 and older. It is a progressive illness characterized by problems with memory, thinking, and behavior. These symptoms can start slowly and get worse over time, eventually interfering with daily activities.

As the most common form of dementia in the United States, AD has a prevalence of about 10 percent in individuals aged 65 or older.[1,2] The illness is characterized by a loss of cell function; the brain cells have trouble communicating with each other and can no longer store or process information. This is due to neurofibrillary tangles, a protein structure that is meant to transport nutrients within brain cells, that become abnormal and collapse. AD is also marked by the buildup of beta-amyloid, which a healthy brain would eliminate to avoid plaque formation. These tangles and plaques lead to a reduction of signaling chemicals, or neurotransmitters, in specific areas of the brain. Although the root cause of AD is unknown, both genetics and lifestyle factors are linked to the disease.

## Diagnosing AD

AD is officially diagnosed when an autopsy or brain biopsy shows the characteristics previously described. However, a probable diagnosis can be made based on the presence of some or all of the following clinical features:

- Gradual decline in memory (especially recent memory)
- Language difficulties including trouble remembering names and trouble speaking
- Problems with vision and motor skills
- Difficulty with reasoning (e.g., judgment, ability to plan and execute)
- Psychiatric and personality changes (e.g., paranoia, delusions, depression, visual hallucinations)

## Genetics and the Development of AD

There are two types of AD, early onset and late onset. Early-onset AD affects adults younger than 65 and is thought to have a significant genetic component. However, it is less common than late onset, accounting for only 6-7 percent of all cases. Genes that play a role in early-onset AD include amyloid precursor protein on chromosome 21, presenilin 1 on chromosome 14, and presenilin 2 on chromosome 1.

Late-onset AD is less clearly linked to specific genes, but is thought to develop due to a combination of genetics as well as risk factors like diabetes and hypertension. Evidence suggests the APOE allele, which is involved in cholesterol transport and beta-amyloid formation, may contribute to AD. The presence of this allele is seen more in women than in men, suggesting women may be at greater risk for developing the disease. However, not everyone who has the allele will develop AD, and not everyone who develops AD will have this genetic component.[3]

## Nutrition Research

Studies show that risk for AD is greater in people who consume high amounts of cholesterol, saturated fat, and excess calories and low amounts of fiber, vegetables, and fruits.[4-6] Just as saturated fat and cholesterol can build up in the blood vessels and form plaques, plaques in the brain compromise blood flow to important parts of the brain.[7] The toxic effect of cholesterol in its oxidized form also leads to inflammation that compromises brain function. In general, diets high in fat can damage neurons and contribute to the formation of beta-amyloid plaques typical of AD.[8-10] Sources of saturated fat and cholesterol include red meat, chicken, fish, dairy products, butter, and eggs.

Early findings in a large-scale Adventist Health study found dementia is more common in meat eaters compared with vegetarians.[11] The relationship between the Western diet and dementia is also apparent when looking at disease rates of cultures that switch from a traditional diet to a Western diet high in saturated fat and simple sugars. Researchers found this to be true in Japan and eight other countries, alongside an increase in obesity. Their eating patterns changed to include more dietary cholesterol, saturated fat, and iron from animal products.[12,13]

Populations that have higher intakes of plant-based foods, especially fruits and vegetables, have a reduced risk for AD.[6] At the Ninth Annual Conference on Alzheimer's Disease and Related Disorders, Harvard researchers discussed the role that fruits and vegetables may play in AD. Jae Hee Kang, ScD., and colleagues evaluated approximately 13,000 participants in the Nurses' Health Study. They tracked the women's intake of fruits

and vegetables for 11 years and compared these values with performance on tests of cognitive brain function when the women were in their 70s. Women who ate the most green leafy and cruciferous vegetables—both high in folate and antioxidants—had less decline in brain function than women who ate of these than women who ate these vegetables less frequently.[14]

B vitamins, including folate, B6, and B12, are important for mental function. These vitamins are involved in the metabolism of a chemical compound called homocysteine. Too little of these vitamins in the diet can lead to dangerously high levels of this compound in the blood. High homocysteine levels are an independent risk factor for both AD and heart disease.[15,16] Good sources of folate include beans, lentils, orange juice, asparagus, walnuts, and green leafy vegetables, such as spinach. Sources of B6 include whole grains (e.g., brown rice), soy foods (e.g., edamame), peanuts, walnuts, bananas, and avocados. Sources of B12 include fortified foods and nondairy milks or a supplement.

> Dementia is **more common** in meat eaters compared with vegetarians.[11]

Recent research suggests that a decrease in insulin function may also play a role in the development of AD. It was once believed that insulin was not needed for glucose to cross the blood-brain barrier. However, research now shows that some regions of the brain are dependent on insulin to allow glucose into the cells, just like our muscles.[17,18] When the body becomes resistant to insulin's action, as in type 2 diabetes, it becomes more difficult for glucose to enter and provide fuel to the brain. Thus, maintaining good insulin function or "sensitivity" can be an important way to prevent dementia.

Eating fewer total calories per day may also benefit brain function. For example, certain populations in China and Japan have low average daily caloric intakes (1,600 to 2,000 calories/day) and lower rates of AD compared to people in the United States and Western Europe (typically consuming more than 2,000 calories/day).[19] A 2002 study of elderly Americans followed for four years found that, compared to those consuming the fewest calories, those consuming the most had an increased risk for AD.[4] To decrease calorie intake, focus on nutrient-dense foods that are naturally low in calories. These include fruits, vegetables, whole grains, beans, peas, and lentils.

## Caring for the Entire Family

As genes can impact the chances of developing AD, patients' family members may have a higher risk for developing the disease. However, following a healthy diet and lifestyle can minimize the risk of developing any chronic illness, even if one is genetically predisposed. This means getting plenty of rest, exercising regularly, and eating a diet based on whole, plant foods like fruits, vegetables, whole grains, and legumes. When someone eats less fat and cholesterol and eats more vitamins, minerals, antioxidants, and phytochemicals from plants, the pathways that lead to disease are less active.

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