

Parkinson's Disease

Making a Difference Today

Each year, about 50,000 Americans are diagnosed with Parkinson's disease, joining the estimated 1 million people already living in the United States with this serious and disabling brain disorder. Parkinson's occurs when nerve cells become damaged or destroyed in the substantia nigra, an area of the brain that is important for normal voluntary movement and coordination. People with Parkinson's experience trembling, muscle stiffness, and slowness of movement. They also often experience depression, anxiety, dementia, constipation, urinary difficulties, and sleep disturbances. Symptoms tend to worsen over time.

In addition to its physical and emotional toll, Parkinson's costs each patient an average of \$4,000 a year for medications. The annual price tag for the U.S. economy—visits to doctors, Social Security payments, nursing home expenditures, and lost income—is estimated at more than \$5.6 billion.

A Momentous Breakthrough

For scientists studying Parkinson's, the first great "eureka" moment came in the 1960s with the discovery that the disease is associated with a loss of the brain chemical dopamine. From that research breakthrough came one of modern medicine's major triumphs: the drug levodopa (L-dopa), which turns into dopamine once it gets into the brain. In 1970, L-dopa became the first drug approved specifically for the treatment of Parkinson's. It largely replaced surgery, the only treatment available at the time.

L-dopa, however, it soon became clear, also has a downside. It often must be taken in ever-increasing doses as Parkinson's progresses, but this can lead to debilitating side effects, from involuntary movements to hallucinations. Scientists have developed additional drugs and strategies over the years to augment its positive effects and to lessen its negative side effects. Research on dopamine and its receptors in the brain, for example, has helped scientists develop new drugs, called dopamine agonists, that cause fewer side effects and work for longer periods of time than L-dopa.

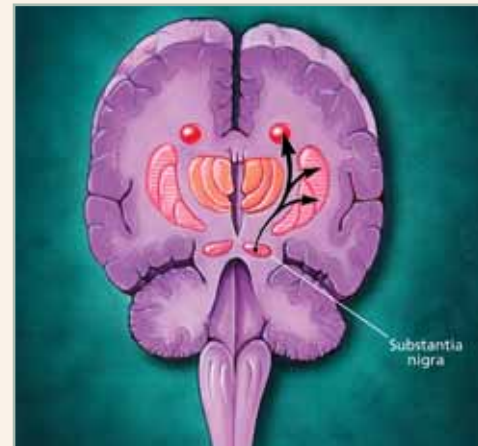
Surgical Treatment

Although surgical treatments fell out of favor after the discovery of L-dopa, they have made a comeback in recent years, thanks in large part to the development of animal models of Parkinson's. These models, developed with the aid of National Institutes of Health (NIH) funding, have enabled scientists to pinpoint which structures deep within the brain are contributing to symptoms of Parkinson's—and thus are targets for therapeutic intervention.

In the mid-1990s, researchers reported that deep brain stimulation of the part of the brain called the thalamus suppressed tremors in patients. The technique uses a surgically implanted electrode connected to a pulse generator implanted under the skin that can be adjusted to control the disabling shaking and trembling caused by the disease. And more recently, scientists have identified other targets for stimulation that can alleviate the other symptoms of slowness of movement and stiffness.

New medications and surgical techniques have greatly improved the lives of people with Parkinson's, but they are not a cure. Backed with NIH grants, researchers are actively searching for treatments that will slow, prevent, or reverse the disease, rather than just lessen its symptoms.

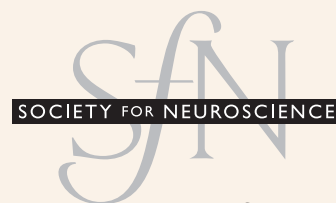
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Parkinson's disease occurs when cells located in a small area of the brain known as the substantia nigra become damaged or destroyed and stop producing dopamine, causing slowed movements, rigidity, and tremors.

Continued funding for research could lead to:

- The development of new drugs that cause fewer side effects and work for longer periods of time than L-dopa.
- More effective surgical treatments.
- The discovery of a biomarker—a biochemical abnormality that all patients with Parkinson's might share—that could be detected by a simple chemical test or other screening technique before symptoms develop.
- Greater understanding of the genetic and environmental factors that play a role in the development of Parkinson's.
- Effective ways to stop or reverse damage to dopamine-producing brain cells.



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Parkinson's Disease

Making a Difference Tomorrow

Scientists have made great strides in understanding Parkinson's disease and its effects on the brain, but a cure remains elusive. Parkinson's continues to devastate individuals and their families. Did you know that:

- An estimated 1 million people are living with Parkinson's in the United States. About 50,000 new cases are diagnosed each year.
- The average age that people are diagnosed with Parkinson's is 60, and the incidence continues to rise with each decade.
- Men are 1.5 to 2 times more likely than women to develop Parkinson's.

NIH-funded basic research has laid the groundwork for many of today's most promising advances for treating Parkinson's.

Research Brings Hope for the Future

Although Parkinson's is inherited in a clear way in a small percentage of cases, it appears that most cases do not result from simple hereditary factors. But many people with Parkinson's do appear to have gene mutations that make them susceptible to environmental and other factors.

One group of scientists recently discovered that a gene that regulates the production of a brain protein called alpha-synuclein is faulty in some people with Parkinson's. NIH-funded researchers are exploring ways to repair such genes—and thus possibly halt or reverse the progression of the disease, not only in people with rare genetic forms, but also in those with the more typical sporadic disease.

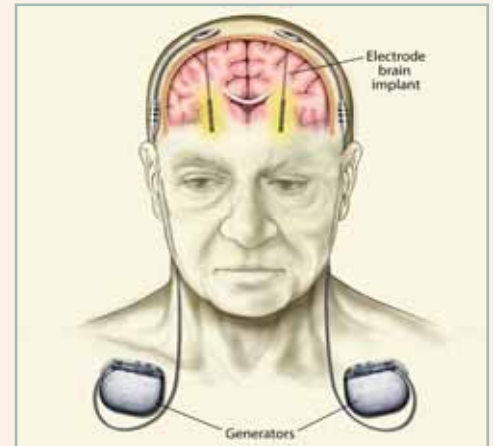
Scientists are getting closer to understanding the relationship among environmental toxins, mitochondria (the parts of cells that produce energy) and Parkinson's. Such studies have led them to examine whether certain antioxidants—substances that help repair damaged cells—might slow the progression of the disease.

Researchers are also exploring various methods of replacing damaged dopamine brain cells, either directly with transplants of healthy dopamine-producing tissue cells or indirectly with substances that cause replacement cells to grow within the damaged area of the brain.

Hope for Other Diseases

As scientists search for new treatments and a possible cure for Parkinson's disease, they are finding that this illness shares much in common with several other neurodegenerative disorders, such as Alzheimer's disease, amyotrophic lateral sclerosis (ALS, or Lou Gehrig's disease), and Huntington's disease. All of these disorders are characterized by the gradual loss of brain cells. All also have no known cause.

Scientists now know the paths that need to be taken to better diagnose and treat Parkinson's disease. But only with continued funding will scientists be able to follow those paths and bring about the medical advances needed to halt the progression of Parkinson's disease, which has devastated so many American lives.



Thousands of patients with Parkinson's disease have been treated with deep brain stimulation, thanks to research funding. One or two pager-sized generators are inserted under the skin, usually near the collar bone. The generators emit tiny electrical pulses that pass along wires, also under the skin, through electrodes implanted in select areas of the brain.

Already research has led to:

- The discovery of L-dopa and other drugs that help reduce the tremors and other symptoms of Parkinson's.
- Improvements in surgical treatments for Parkinson's, including deep brain stimulation.
- The discovery of several genes and their corresponding protein products that play a role in at least some cases of hereditary forms of Parkinson's.
- The development of animal models of Parkinson's that will help researchers develop new strategies for slowing or stopping its progression.

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