

## Multiple Sclerosis: The Basics

### WHAT IS MULTIPLE SCLEROSIS?

Multiple sclerosis (MS) is a chronic disease that affects the central nervous system (CNS), which is made up of the brain, spinal cord, and optic nerves. MS damages the myelin sheath, a fatty coating that surrounds and protects nerve cells, and can also damage the nerve fiber itself. This damage is caused by the body's immune system entering the CNS and mistakenly attacking the nerves. This damage slows down or blocks messages between the brain and the body. Experts estimate that nearly 1,000,000 people in the United States are diagnosed with MS. Twice as many women are affected as men. MS is classified into four types, based on the clinical manifestation of the disease.

- **Clinically isolated syndrome (CIS)** is an initial episode of neurologic symptoms caused by inflammation and demyelination. The person does not fulfill strict criteria for a diagnosis of MS, but may have a high probability of going on to develop the disease.
- **Relapsing-remitting MS (RRMS)** is characterized by relapses (periods of symptom flare-up) followed by remission (periods of recovery).
- **Secondary-progressive MS (SPMS)** signals the end of the pattern of relapse and remission in people with RRMS, but the disease progresses, and impairment and disability continue to worsen over time. Sometimes relapses may occur while the disease continues to progress.
- **Primary-progressive MS (PPMS)** progresses slowly and steadily from its onset. There are no periods of remission, although acute relapses may occur. About 15 percent of people who have MS have this form of the disease.

### WHAT ARE THE SYMPTOMS?

Symptoms can include fatigue, tingling, numbness, loss of balance, blurred or double vision, and weakness in one or more limbs. Muscle stiffness, pain, urinary symptoms, and cognitive problems may also develop as the disease progresses.

### HOW IS IT DIAGNOSED?

Physicians must find evidence of damage in at least two separate areas of the CNS and find evidence that the damage occurred at two different points in time or meet other diagnostic criteria based on MRI and spinal fluid results. It is also essential to rule out all other possible diagnoses. The most common diagnostic tests include MRI, lumbar puncture (spinal tap), and electrical tests (evoked potentials) that can detect evidence of nerve damage that may not show up on an examination or MRI. Blood tests may also be ordered to rule out other conditions that may mimic MS.

### HOW IS IT TREATED?

While there is no cure for MS, the disease is highly treatable. Sixteen drugs, called disease-modifying therapies, have been approved by the US Food and Drug Administration to reduce relapses as well as decrease inflammation and new areas of nerve damage on MRI: beta interferons (Avonex, Betaseron, Extavia, Rebif, and Plegridy); glatiramer acetate (Copaxone, Glatopa, and Mylan's glatiramer acetate); fingolimod (Gilenya); natalizumab (Tysabri); mitoxantrone (Novantrone); dimethyl fumarate (Tecfidera); alemtuzumab (Lemtrada); daclizumab (Zinbryta); ocrelizumab (Ocrevus); and teriflunomide (Aubagio). Treatment also includes symptom management and lifestyle modification, which can improve function and quality of life. Additionally, new information is emerging about the importance of diet, exercise, and not smoking in promoting wellness in people with MS.

### WHAT RESEARCH IS BEING CONDUCTED?

The National Institute of Neurological Disorders and Stroke ([ninds.nih.gov](https://ninds.nih.gov)) is one of many institutions that conducts research to create new and better therapies for MS. Much current research is focused on strategies that will not only stop damage to nerves, but also help to repair damaged nerves and restore function.

For more *Brain & Life* articles on multiple sclerosis, go to [BrainLifeMag.org/MS](https://BrainLifeMag.org/MS).

For more resources and support, contact:

- Multiple Sclerosis Association of America: [mymsaa.org](https://mymsaa.org); 800-532-7667
- Multiple Sclerosis Foundation: [msfocus.org](https://msfocus.org); 888-MSFOCUS (673-6287)
- Myelin Repair Foundation: [myelinrepair.org](https://myelinrepair.org); 408-871-2410
- National Multiple Sclerosis Society: [nationalmssociety.org](https://nationalmssociety.org); 800-344-4867

**PUBLICACIONES EN ESPAÑOL:** *Brain & Life* en Español y Basics en Español disponibles ya en [BrainandLife.org](https://BrainandLife.org); Esclerosis Multiple: Esperanza en la Investigación: [bit.ly/NINDS-EM-Espanol](https://bit.ly/NINDS-EM-Espanol)