

Multiple Sclerosis



Yesterday

- Multiple sclerosis (MS) was first recognized as a disorder in the late nineteenth century, but only by the nineteen sixties did researchers first begin to understand some of the disease processes that cause symptoms and long-term disability. These processes seemed to involve inflammation and the loss of myelin, a protective covering around nerve fibers.
- The first standard guidelines for the diagnosis of MS and a disability rating scale were also established in the nineteen sixties, setting the stage for clinical research to test new therapies.
- In the late sixties, the first controlled clinical trials for MS therapy showed that treatment with adrenocorticotrophic hormone (ACTH) could speed recovery from an attack. While this therapy helped to reduce inflammation during the acute symptoms of an attack, it did not slow progression of the disease.

Today

- MS is recognized as a chronic, inflammatory and autoimmune disease of the central nervous system. It is among the most common causes of neurological disability in young adults and occurs at least twice as frequently in women as in men.
- Research has now shown that MS not only damages the myelin covering of nerve fibers but also causes degeneration of the nerve fibers themselves. Depending on which nerve fibers in the brain and spinal cord are affected, MS can impair movement, coordination, sensation, and thinking. For most people with MS, episodes of worsening function (relapses) are initially followed by recovery periods (remissions). Over time, recovery may be incomplete, leading to progressive decline.
- Magnetic resonance imaging (MRI), first used in patients with MS in the nineteen eighties, has shown that damage to nerve fibers may be present at very early stages of the disease and may remain when

symptoms subside. MRI has also revolutionized the diagnosis of MS, reducing the average time from first symptoms to diagnosis from several years to months.

- Several FDA-approved therapies are now available to ameliorate the symptoms of MS and to, in some cases, slow disease progression. NIH-supported research contributed to the development of many of these treatments, which include the beta interferons (Betaseron[®], Rebif[®], Avonex[®], Extavia[®]), copolymer 1 (Copaxone[®], also called glatiramer acetate), the immunosuppressant mitoxantrone (Novantrone[®]), and most recently, natalizumab (Tysabri[®]), an antibody-based therapy that represents a new class of immunomodulatory agents for treating MS.
- Although the direct causes of MS remain unknown, studies in an animal model of MS have significantly advanced scientists' understanding of the immune and inflammatory processes that cause damage to myelin and nerve fibers. NIH-supported scientists recently reported the first genes linked to MS since the nineteen seventies, and ongoing studies continue to search for additional genetic and non-genetic risk factors, including exposure to viruses, cigarette smoking, vitamin D levels, and reproductive history.

Tomorrow

- Treatments will be available to more effectively slow or halt the progression of MS. Combination therapy with existing treatments may improve care in the near term, and NIH supports a Phase III clinical trial (CombiRx) (<http://clinicaltrials.gov/ct2/show/NCT00211887>) to determine if treatment combining beta-interferon and glatiramer acetate offers an improvement over the partial efficacy of either common medication alone. NIH is also conducting a trial to test the safety and efficacy of the drug idebenone as a treatment for primary progressive MS, for which therapies are currently lacking. Idebenone is similar to the natural compound coenzyme Q10 and may protect against tissue damage.

- Researchers will identify brain imaging and molecular biomarkers associated with MS susceptibility, disease progression, and treatment response profiles. NIH intramural investigators are collaborating with the CombiRx trial to identify biomarkers associated with clinical features and responses to different treatments. Such biomarkers will facilitate early diagnosis and therapy development research, and they could also inform predictions about which treatment regime will most likely benefit a given patient.
- Further advances in understanding the genetic and environmental causes of MS will help identify those at higher risk for the disease. Along with growing knowledge about the mechanisms that lead to symptoms, these advances will point to new targets for developing treatments and preventive strategies.
- Research on neuroimmune interactions and the processes of neurodegeneration and repair will lead to a new generation of neuroprotective therapies that will complement current MS treatments. These neuroprotective agents will help to prevent, reduce, or even repair the damage to nerve fibers that can cause long-term, progressive impairments.

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National Institute of Neurological Disorders and Stroke (NINDS) website:

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