A DEGENERATIVE AFFLICTION

Multiple sclerosis often strikes between the ages of 20 and 40, when people are entering the workforce and raising families.

By Charles Schmidt; illustration by Lucy Reading-Ikkanda.

TURNING AGAINST THE SELF

Multiple sclerosis is an incurable illness in which the body's own immune system destroys tissues in the central nervous system. T cells and B cells are thought to remove a protective coating called myelin that wraps around nerve fibres in the brain, spinal column and optic nerve. Exposed fibres are degraded, producing symptoms that vary depending on where the damage occurs.

A DIFFICULT DIAGNOSIS

Symptoms differ from person to person, making diagnosis difficult. Common symptoms include vision problems, weakness, instability and loss of bladder control. The proportion of people with some of the most common symptoms are shown below.

TYPES OF MULTIPLE SCLEROSIS

Relapsing–remitting multiple sclerosis (RRMS) produces attacks followed by periods of remission that can last months or years. It usually gets worse with time. In primary progressive multiple sclerosis (PPMS), symptoms worsen steadily without remission.

WHAT CAUSES MULTIPLE SCLEROSIS?

The cause is unknown, but it is thought to involve an interplay of genetics and the environment. Genetic susceptibility drives the risk, but the contribution of any specific gene seems to be modest.

Environmental factors

Living further from the Equator boosts risk, possibly because of reduced exposure to sunlight — the main source of vitamin D.

Epstein-Barr virus

Few people who have been infected with the Epstein-Barr virus develop multiple sclerosis, but nearly everyone with the condition has been infected with the virus.

Smoking

Numerous studies have found higher rates of multiple sclerosis in smokers than in non-smokers.

Genetic factors

Combined with vitamin D deficiency, the *HLA-DRB1*1501* allele and the *CYP27B1* gene may elevate risk. *IL2RA* gene variants may increase the risk for individuals without a family history of the disease. *IL7R* variants are associated with PPMS.

GLOBAL INCIDENCE

Multiple sclerosis is most common in northern latitudes, reflecting the likely association with reduced exposure to sunlight and vitamin D deficiency.

Prevalence per country

Number of people with multiple sclerosis per 100,000

2.3 MILLION

Estimated number of people worldwide with the condition.

DISEASE-MODIFYING THERAPIES

Several drugs have been approved for RRMS, but none for PPMS. Drugs need to be given as soon as possible to slow the pace of neurological damage.

ALEMTUZUMAB

A monoclonal antibody also approved for leukaemia, alemtuzumab binds to CD52, a protein on the surface of mature B cells and T cells, which are then targeted for destruction by the immune system. Widespread B-cell depletion from alemtuzumab treatment may promote the growth of T cells that are less autoreactive and do not cause inflammation.

FINGOLIMOD

T cells in the lymph nodes develop into central memory T cells, which predominate in the cerebrospinal fluid of people with multiple sclerosis. Fingolimod binds to the S1P receptor on T cells, trapping them in the lymph nodes so they cannot reach neurological tissues.