The immunology and neurobiology of multiple sclerosis
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Multiple sclerosis (MS) is a neuroinflammatory disease of the central nervous system (CNS). The disease is characterized by a considerable heterogeneity of disease course and clinical manifestations — which can include visual and sensory disturbances, motor impairments, pain, fatigue and cognitive deficits. However, most individuals with MS show a progressive accumulation of disability in the later stages of the disease. Disease onset usually occurs around 30 years of age, and people with the condition have a near-normal life expectancy; thus, MS is a chronic debilitating disorder. Here, we summarize key immune and nervous system cell types and molecules that are involved in the pathophysiology of MS. We delineate the roles of innate and adaptive immune cells, in the periphery and within the CNS, and we provide an overview of how the relative contributions of immune and nervous system components change over time as the chronic neurodegenerative damage to the CNS ultimately overwhelms neuroprotective and/or neuroregenerative mechanisms. We also highlight the sites of action of currently available drugs, where known, and therapeutic strategies that are under investigation.