Until recently, many scientists viewed immune cells and the central nervous system (CNS) as a deadly mix. A classic example is multiple sclerosis, where T lymphocytes, together with other inflammatory mediators, damage the protective myelin sheath that encases nerve fibers in the brain and spinal cord. Decades of research on this autoimmune disorder opened a window into how the immune system and the CNS interact, but more recent research efforts have revealed the exceptionally broad scope of communication between the two. We now know that the immune system is very likely a key player in many neurological diseases and, surprisingly, that immune-CNS interactions may not all be bad.

The immune system’s reach within the CNS is extensive, probably contributing to the initiation and pathogenesis of neurodegenerative diseases, neurodevelopmental disorders such as autism, and mental health disorders such as schizophrenia. Disease-driving mechanisms vary and include, among others, the pruning of neuronal synapses, effects on CNS development in utero, and inflammation. Although immune cells can clearly be a liability, they are likely also essential for normal brain development and function and for recovery from trauma.

These exciting revelations place neuroimmunology at the forefront of biomedical research priorities. With the potential to affect such a diverse array of neurological ailments, many of which have no known therapy, the hope is that an improved understanding of immune-CNS interactions will bring to light new paradigms for preventing and treating neurological disease.

By Kristen L. Mueller, Pamela J. Hines, and John Travis