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Neuroimmunology

Susan Jones*

Editorial Office, Journal of Clinical Neurology and Neurosurgery

Introduction

Neuroimmunology is a branch of biology that includes basic and applied biology, immunology, chemistry, neurology, pathology, psychiatry, and virology of the Central Nervous System (CNS). Scientists in the discipline investigate the interconnections of the immune and neurological systems throughout development, homeostasis, and injury response, with the ultimate goal of finding methods to cure or prevent neuroimmunological disorders. Neuroimmunologists study the interplay of these two complex systems throughout development, homeostasis, and injury response. One long-term objective of this fast growing research area is to improve our understanding of the pathophysiology of some neurological disorders, some of which have no known cause. Neuroimmunology helps to discover novel pharmacological therapies for a variety of neurological disorders. Many interactions include both the neurological and immunological systems, including physiological functioning of the two systems in health and sickness, malfunction of one or both systems that leads to diseases, and physical, chemical, and environmental stresses that affect both systems on a regular basis.

Despite the fact that the connection between the neurological and immune systems has been recognised for many decades, the term "neuroimmunology" was first coined in the 1960s. The National Institute of Mental Health has also developed a specific 'neuroimmunology program' to promote research into the impact of immune cells, cytokines, and chemokines on brain development, synaptic plasticity, signal transduction pathways, neuronal circuits, and behaviors. Despite possessing a well-controlled immune system, brain cells are susceptible to autoimmune disorders such as multiple sclerosis. When an autoimmune illness develops, the immune system begins to attack the body's own cells and proteins, mistaking them for foreign particles. As a result, a chain reaction of negative consequences occurs, which can be deadly, especially if the attack occurs inside the brain.

Epigenetic medicine is a field of neuroimmunology that examines the brain and behaviour. It has revealed mechanisms underpinning brain development, evolution, neuronal and network plasticity and homeostasis, senescence, the genesis of many neurological disorders, and neural regeneration processes. It's resulting in the identification of environmental stressors that influence the onset of particular neurological diseases and disease biomarkers. Other data suggests that epigenetic processes have a role in the development and deployment of the innate and acquired immune systems in response to stresses on cellular and systemic functional integrity, as well as the emergence of autoimmunity. Autoimmunity is increasingly being connected to specific dysregulation of epigenetic pathways, suggesting that epigenetic therapeutic drugs might aid in the reversal of complicated pathogenic processes. Multiple Sclerosis (MS) is a neuroimmune illness that affects a large number of people. Multiple sclerosis is characterised by inflammation of the central nervous system, immune-mediated demyelination, and neurodegeneration. The major objective is to use epigenetic reprogramming of endogenous regional brain stem cells to "encourage faster recovery of damaged and seemingly irreversibly lost cognitive, behavioural, and sensorimotor abilities". Erroneous epigenetic pathways may play a role in neurodegenerative illnesses, according to mounting data. Huntington's disease and Alzheimer's disease are examples of neurodegenerative disorders. The absence of basic Mendelian inheritance patterns, worldwide transcriptional dysregulation, and many forms of harmful RNA changes have all been discovered in neuroimmunological study into these illnesses.

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***Address for Correspondence:** Jones S, Editorial Office, Journal of Clinical Neurology and Neurosurgery, E-mail: nanomoleculesepubjournals.com*

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