Alterations in Oligodendroglia Lineage Cells and Their Impact in Major Depressive Disorder

Mullahy, Matthew (School: Smithtown High School East)

Mood and anxiety disorders, such as Major Depressive Disorder (MDD), affect one out of every six people in their lifetime and over 350 million people per year. Postmortem human brain studies as well as mouse models have revealed that decreases in NG2 glia - oligodendrocyte progenitor cells - are linked to MDD. Immunohistochemistry was performed on sections of C57BL/6J mouse brain tissues using antibodies to characterize proliferation and cell density of NG2 glia, as well as cytogenesis. In the prefrontal cortex, an area linked to depression, large decreases in NG2 glia density and proliferation were found. In the subventricular zone, an area affiliated with high levels of oligodendroglial proliferation, there was evidence of a substantial decrease of cytogenesis in depressed mice as compared to control. Additionally, current investigation into apoptotic mechanisms pose a possible explanation for the reduction in NG2 glia density. This study's findings of a correlation between depression and the decreased NG2 glia cells necessitate future research into the GSK3 mechanism, a regulatory switch involved with NG2 glia decline, which is expected to reveal alterations in the cellular dynamics of NG2 glia that lead to MDD. An understanding of the fundamental biological mechanisms behind depression will aid the study of MDD and the development of pharmacological therapeutics.

Awards Won:

American Psychological Association: First Award of $1,500