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Opinion Article

Exploring the Impact of Epigenetics on Major Depressive Disorder Development

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DESCRIPTION

Major Depressive Disorder (MDD) is a complicated and multifaceted disorder that affects about 280 million people around the world. The causes of MDD are not fully clear, but they are known to involve both genetic and environmental factors. One of the ways that these factors interact is through epigenetics. Epigenetics is the study of how gene expression changes without altering the DNA (Deoxyribonucleic Acid) sequence. These changes can be caused by severe stress and can make the brain's emotional regions more susceptible. Epigenetic mechanisms such as DNA methylation and histone modifications can cause lasting and stable changes in gene expression. These changes are often related to the diagnosis and treatment of MDD. There is growing evidence that epigenetics may have a role in the development and progression of psychiatric disorders such as MDD. For example, the biological effects of environmental factors in MDD are mediated by various epigenetic modifications. These modifications affect the normal functioning of the neuroendocrine system, neuroplasticity, neurotransmission, and neuroglia, which are involved in the development and progression of MDD.

Furthermore, the epigenetic regulation of the *BDNF* is (Brain-Derived Neurotrophic Factor) gene influences how an individual reacts to environmental stimuli, stress, and even their response to antidepressant treatments. This suggests that understanding the role of epigenetics in MDD could potentially lead to better treatments. Nutrition also has an important role in the epigenetic mechanisms of MDD. The common scenario of stress and hustle in developed countries often leads to eating disorders that imply over nutrition from high-carbohydrates and high-fat diets with low micronutrients intake. As diet is considered an important environmental factor, the epigenetic mechanisms that undergo adaptation or consequence on their signalling and expression mechanisms are reviewed. Epigenetic modifications, such as DNA methylation, post-translational histone modification, and interference of micro Ribonucleic Acid (miRNA) or long non-coding RNA (lncRNA), can affect the severity and outcome of the disease and the therapy. These modifications affect the normal functioning of the neuroendocrine system, neuroplasticity, neurotransmission, and neuroglia, which are involved in the development and progression of MDD. One possible therapeutic approach is the use of histone deacetylases, which have shown antidepressant effects. Additionally, miRNAs or lncRNAs could serve as markers of depression, providing a new way for diagnosis and treatment.

Moreover, understanding the role of epigenetics in MDD could potentially lead to better treatments. For instance, the epigenetic regulation of the *BDNF* gene can influences how an individual reacts to environmental stimuli, stress, and even their response to antidepressant treatments. In summary, the assessment of epigenetic modifications offers hope for further understanding of the diverse causes and complex features of MDD, and may identify new therapeutic targets. However, more research is needed to fully understand these mechanisms and how they can be used for therapeutic purposes. The role of epigenetics in understanding the causes of MDD is significant. It provides a way to connect genetic and environmental factors. The assessment of epigenetic modifications offers hope for further understanding of the diverse causes and complex features of MDD, and may identify new therapeutic targets. However, there is a lack of information regarding the validation of depression-associated epigenetic modifications due to the newness of this field of study, the small number of patients, and the challenges to study functional changes in living brains instead of post-mortem.

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