

## Role of Neuroepigenetics in Neurodegenerative Diseases

Kentro Hayashida\*

Department of Cardiology, Keio University School of Medicine, Tokyo, Japan

### DESCRIPTION

Neuroepigenetics is an emerging field of study that investigates the complex interplay between genetic and environmental factors in the development and function of the brain. The study of epigenetics involves the modification of gene expression without altering the DNA sequence. Epigenetic changes can be influenced by a variety of environmental factors, including nutrition, stress, drugs, and social interactions. Recent advances in genomic technology have allowed scientists to study the epigenetic changes in the brain with increasing precision, leading to a greater understanding of the role that epigenetics plays in brain development, aging, and disease. One of the primary goals of neuroepigenetics research is to identify the specific epigenetic changes that occur in the brain in response to different environmental stimuli. For example, studies have shown that maternal care can alter the epigenetic regulation of genes involved in stress response, leading to changes in behavior and cognitive function later in life. Similarly, exposure to drugs or toxins can cause epigenetic changes in the brain that may contribute to addiction or other neurological disorders.

Another important area of research in neuroepigenetics is the study of epigenetic changes in the aging brain. Aging is associated with a variety of changes in the brain, including a decrease in cognitive function and an increased risk of neurodegenerative diseases such as Alzheimer's and Parkinson's. Epigenetic changes have been shown to play a role in these age-related changes, with studies showing that certain epigenetic modifications are associated with a decline in cognitive function and an increased risk of neurodegenerative disease.

One of the important applications of neuroepigenetics research is in the development of new treatments for neurological disorders. By understanding the specific epigenetic changes that occur in the brain in response to different environmental stimuli, researchers may be able to develop drugs that can selectively target these changes, potentially leading to new treatments for a variety of neurological disorders. For example,

drugs that target epigenetic modifications associated with addiction may be used to treat drug addiction, while drugs that target epigenetic modifications associated with neurodegenerative diseases may be used to slow or even prevent the progression of these diseases.

However, there are also challenges and limitations associated with the study of neuroepigenetics. One major challenge is the complexity of the epigenetic changes that occur in the brain. Epigenetic modifications can occur at multiple levels, including DNA methylation, histone modification, and non-coding RNA regulation, and can interact with each other in complex ways. Additionally, epigenetic changes can be highly dynamic and can vary between different cell types and brain regions, making it difficult to study these changes at a high resolution. Another challenge is the difficulty in distinguishing causation from correlation in neuroepigenetics research. While studies have identified correlations between specific epigenetic changes and neurological disorders or environmental stimuli, it is often difficult to establish a causal relationship between these factors. For example, it is unclear whether epigenetic changes in the brain are a cause or a consequence of neurological disorders such as Alzheimer's disease.

### CONCLUSION

Despite these challenges, neuroepigenetics research holds great promise for improving our understanding of the brain and developing new treatments for neurological disorders. By identifying the specific epigenetic changes that occur in the brain in response to different environmental stimuli, researchers may be able to develop targeted therapies that can improve brain function and prevent or treat neurological disorders. Additionally, advances in genomic technology are allowing researchers to study epigenetic changes in the brain with increasing precision, which may lead to new insights into the complex interplay between genes and the environment in brain development and function.

**Correspondence to:** Kentro Hayashida, Department of Cardiology, Keio University School of Medicine, Tokyo, Japan, E-mail: verondel@outlook.com

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