Epigenetics is the study to changes in gene function.

It refers to modification to DNA and the protein that interacts with it.

The modification influences regulation and expression of the gene.

It can also turn the genes “on” or “off”, can affect the phenotype and the organism’s development.

The modifications are not always inherited.

The Epigenome refers to the collection of epigenetic changes to the DNA and histones in a living organism, cell, organ, or similar entity. (Encode, sd)

TSS (Transcription Start Sites) and Splice variant, both are alternative promoter.

DNA methylation is a type of epigenetic mechanism in which a methyl group is added to the cytosine base of a DNA molecule. This regulates gene expression and is involved in the development of differentiated cells with unique DNA methylation patterns. DNA methylation is also associated with histone modification and non-coding RNA molecules. In the nervous system, DNA methylation is dynamic and regulated by factors such as neuronal activity and environmental stimuli and is essential for normal cognitive function. Abnormal DNA methylation can result in mental impairment and is a possible target for treating neuropsychiatric disorders. (Lisa D Moore, sd) (Binzer-Panchal)

Diagram

Description automatically generated (wikipedia, sd)

CG sites are regions in DNA where a cytosine nucleotide is followed by a guanine nucleotide. These sites often occur in clusters called CG islands and DNA methylation, a type of epigenetic modification, is almost exclusively found in these CG dinucleotides. The cytosines on both strands can be methylated. (Binzer-Panchal)

The mechanism of epigenetics is affected by multiple factors like, Aging, Diet, Drugs, Pharmaceuticals and Environmental chemicals.

And the mechanism affects multiple factors too, Cancer development, Autoimmune diseases, Mental disorders and Diabetes. (Health, sd)

The changes can be detected for up to three generations.

Epigenetic changes were analyzed and defined into three categories: Direct (DE), Within-Individual (WIE), and Across-Generations (AIE). DE changes occur in an individual's lifetime due to direct environmental experiences. WIE changes happen during gestation and are influenced by events inside the womb. AIE changes affect an individual's ancestors due to events before conception and are transmitted across generations. (Ventura, 2018)

Bibliography:

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