Understanding the Epigenome: The Master Switch of Aging

What is the Epigenome?

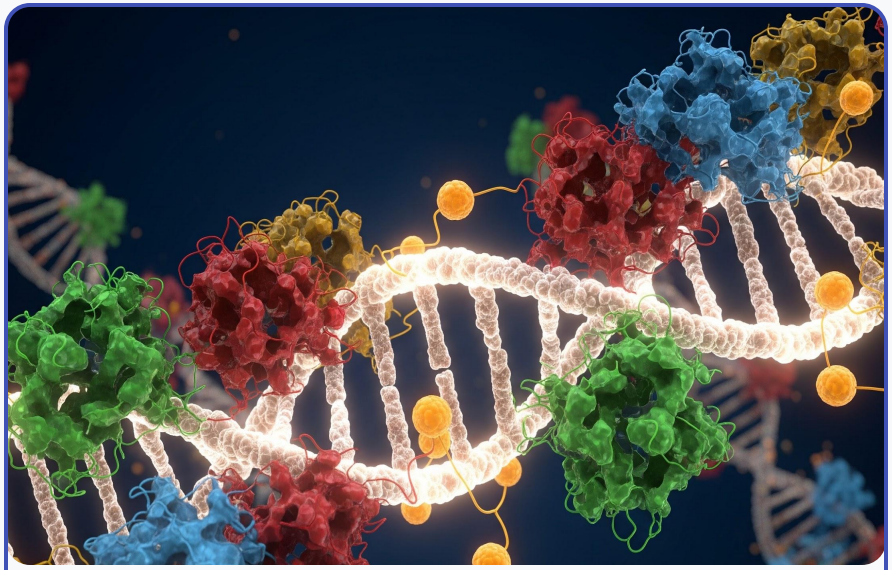
DNA is enveloped with protein - **THE EPIGENOME** - that can switch genes on or off, or tune their expression levels up and down.

The Chemical Logic

Methyl Groups turn ON gene expression (vital for proteins), while **Acetyl Groups (HDACs)** switch genes OFF.

Biological vs. Chronological Age

DNA-methylation "clocks" measure a person's **biological age** compared to their calendar age.



Aging is characterized by reduced methylation, which adversely alters essential gene expression.

The Epigenome: Genes Switched OFF in Ageing

The Epigenetic Envelope

DNA is enveloped with protein—**THE EPIGENOME**—that acting as a master switch to turn genes on or off, or tune expression levels.

Chemical Logic of Aging

Methyl Groups turn ON vital gene expression, while **Acetyl Groups (HDACs)** switch them OFF. Ageing is marked by a decline in methylation.

Adverse Impact on Longevity

Reduced methylation **adversely** affects gene expression, switching off essential genes needed for manufacturing vital proteins.

Strategic Interventions to Improve Epigenetic Methylation

GHK-Cu Peptide

A copper-binding peptide found to reverse age-related gene expression in fibroblasts, effectively "rejuvenating" the epigenome.

Tri-Methyl-Glycine (TMG)

Also known as Betaine, TMG serves as a vital methyl donor, supporting the chemical processes required to turn genes ON.

Dietary & Natural Support

Additional substances known to enhance DNA repair and methylation processes:

- EGCG
- Macha Tea
- Fucoidan

Epigenetic Biological Clocks: Measuring Cellular Age

The Horvath & Hannum Clocks

First-generation clocks that use DNA methylation patterns across specific CpG sites to predict chronological age with high precision.

PhenoAge & GrimAge

Second-generation "Biological Clocks" like Morgan Levine’s PhenoAge and the GrimAge clock incorporate clinical biomarkers to predict morbidity and lifespan.

DunedinPACE / DunedinPoAm

A "speedometer" for aging, measuring the current rate of biological decay rather than a static point in time, based on longitudinal study biomarkers.

DNA Methylation is the "gold standard" biomarker for determining internal biological age vs. calendar age.