BHARATHIDASAN UNIVERSITY

Tiruchirappalli- 620 024
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Programme: M.Sc. Biochemistry

Course Title : Chromatin and Epigenetics
Course Code : BC205DCE

Unit-5
Epigenetics and Diseases

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Unit-5 Overview

- Predisposition to disease
- Imprinting based disorders
- Epigenetics of memory, neurodegenaration and mental health
- Kidney, diabetes and cardiovascular disorders

Epigenetics and Environment

Epigenomes of higher organisms constantly change over time

necessary to direct normal cellular development and differentiation in the developing organism

developmental abnormalities may occur in response to inappropriate epigenetic signaling

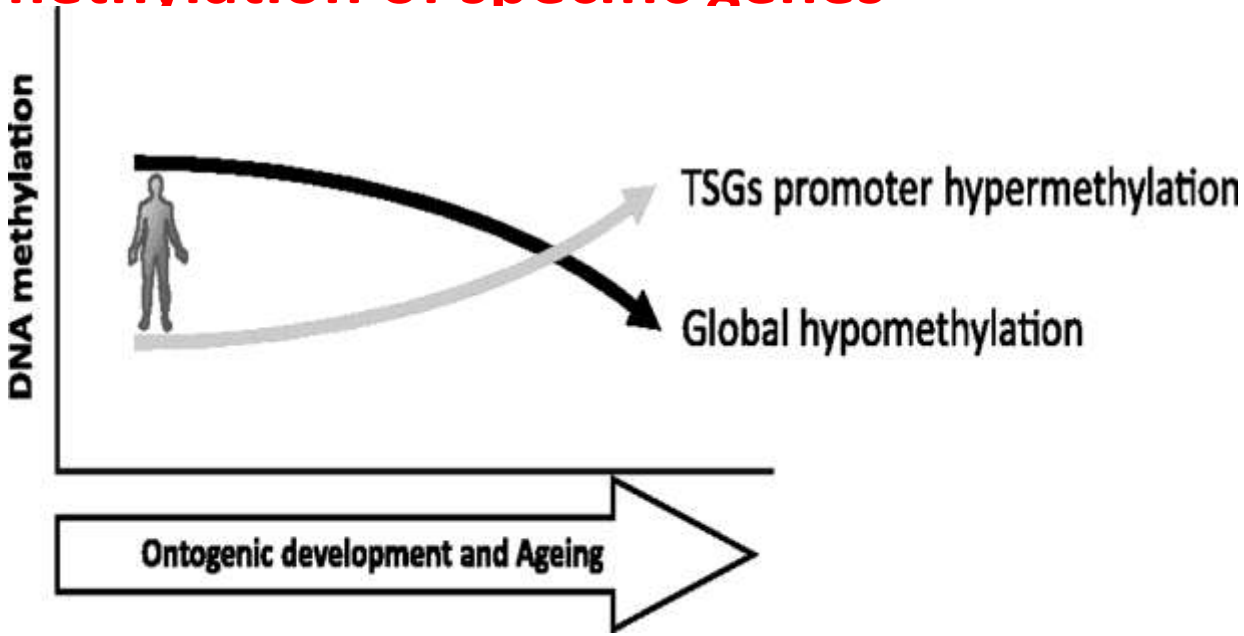
epigenetic variation can arise as a consequence of environmental factors

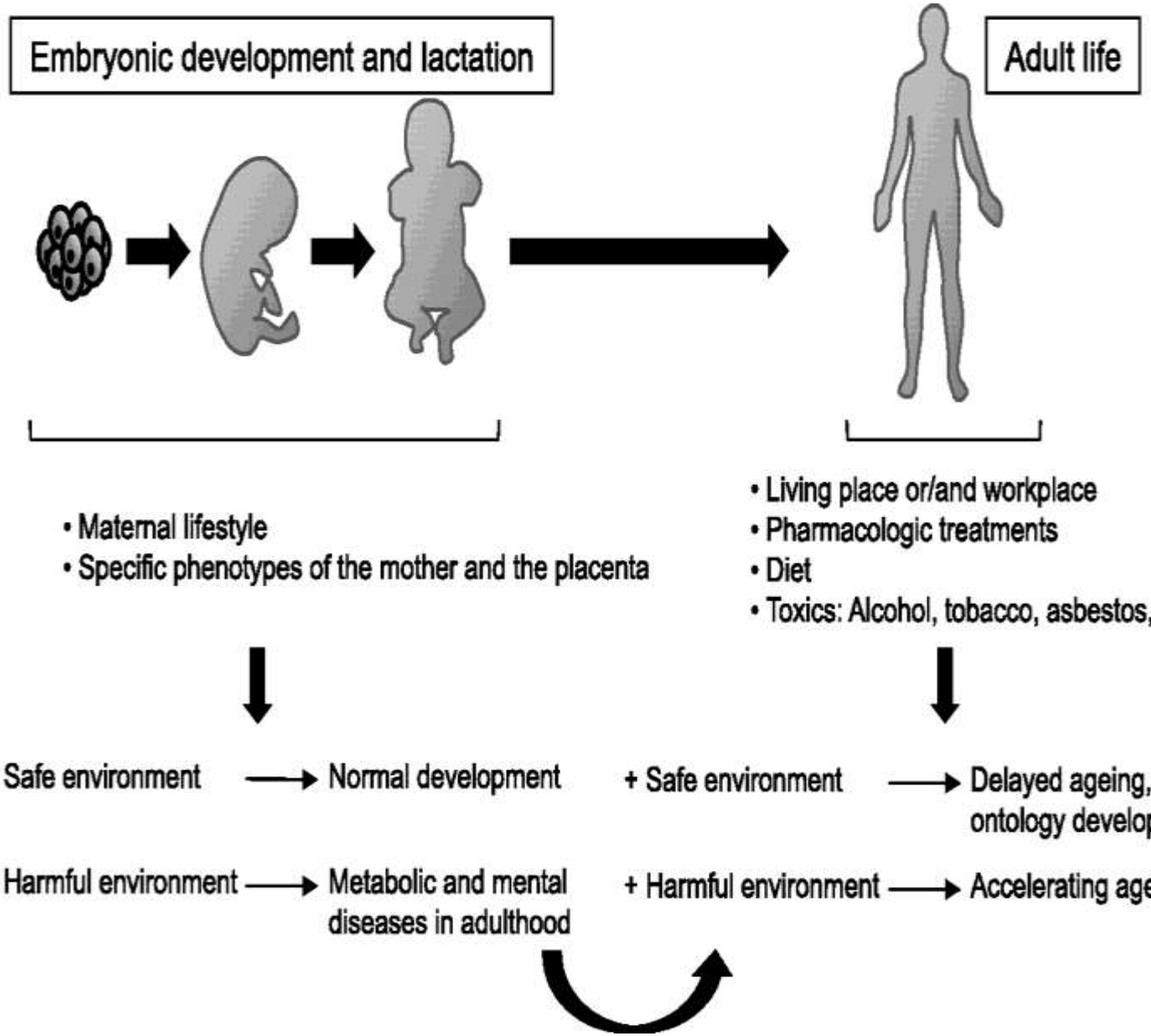
LIFETIME EPIGENETIC CHANGES

Association between epigenetics and aging genomic global DNA methylation

Failures in DNMT1

global DNA hypomethylation and promoter hypermethylation of specific genes




Embryonic development and lactation
Adult life
• Maternal lifestyle
• Specific phenotypes of the mother and the placenta
• Living place or/and workplace
• Pharmacologic treatments
• Diet
• Toxics: Alcohol, tobacco, asbestos, ...
+ Safe environment
Normal development
+ Harmful environment
Metabolic and mental diseases in adulthood
+ Safe environment
Delayed ageing, normal ontology development
+ Harmful environment
Accelerating ageing, cancer

Impact of the Environment on the Epigenome During Embryonic Development

environmental conditions in the uterus

determine phenotypic alterations in the offspring persist throughout life

environmental conditions during embryonic development determined by two factors

1. The specific phenotypes of the mother and the placenta, which determine characteristics, such as the size of the uterus and the availability of nutrients

2. The mother's lifestyle

Relationship Between Environment and Epigenetics During Adult Life

divided into four groups:

1. **Diet**
2. **living place and/or workplace**
3. **pharmacological treatments**
4. **and unhealthy habits**

Interplay of Epigenetics, Genome Rearrangement, and Environment

Genome rearrangement, characterized by insertion, deletion, amplification, inversion, and/or transposition of DNA segments

These genome restructuring processes are driven by epigenetic markings

These genome restructuring processes are driven by epigenetic markings

modifiable by external and internal environments

genome rearrangement establishes a new state of genomic control via epigenetic marks

Epigenetic reprogramming occurs during mammalian development

Genome rearrangement, which introduces genome diversity, is a driving force of mammalian development

Direct evidence of genome rearrangement in mammals at organismal level is still missing

indirect evidence supporting that such genome rearrangement occurs at organismal level.