Can maternal diet have multi-generational effects?

Epigenetics is the study of how our environment and behavior (diet and exercise) can cause changes that affect the way the genes work.

Studies have shown that environment and behavior:[1]

- Affect gene expression by DNA methylation, histone modifications, and non-coding RNA.
- Make changes that are reversible and don't change the DNA sequence.
- Make changes that remain for decades and are passed from one generation to the next.

Nutrition can influence early developmental processes through the regulation of epigenetic mechanisms during pregnancy and neonatal periods[2]

Maternal nutrition contributes to the establishment of the epigenetic profiles in the fetus that have a profound impact on individual susceptibility to certain diseases in the offspring later in life.[2]

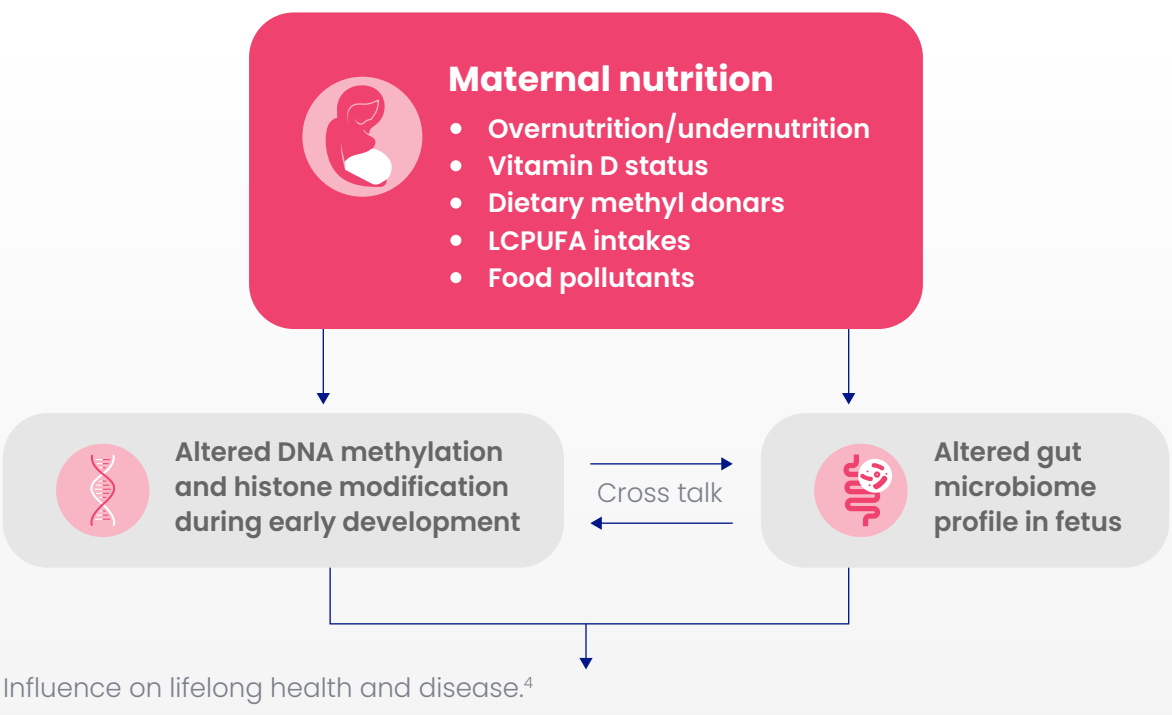
- Maternal diet
- Maternal and paternal genetic background
- Maternal lifestyle
- Maternal stress
- Exposure to environmental factors
- Composition of microbiota

Epigenetic modifications during development

- Altered gut microbiome profile in fetus
- Chromatin remodelling, histone post-translational modifications
- DNA methylation/ demethylation
- miRNA regulation

- Obesity
- Metabolic syndrome
- Cardiovascular disease
- Low birth weight
- Development illness
- Mental illness
- Diabetes

Maternal nutrition can influence the microbiome and epigenome



- Influence on lifelong health and disease.[4]
- Affect the barrier properties of gut mucosa - development of late-onset inflammatory diseases[4]
- Late-life obesity.[2]

Maternal under-nutrition or nutrition deficiency[3]

Epigenetic mechanisms can be responsible for fetal programming[6]

Accelerate early postnatal growth by an increased rate of gaining body fat rather than muscle tissue.[6]

Increased risk of obesity, insulin resistance, diabetes, and dult-onset metabolic syndrome in the adult offspring.[5,6]

Maternal over-nutrition

Epigenetic mechanisms can be responsible for fetal programming[6]

Obesity, hypertension, hyperlipidemia, insulin resistance, and diabetes in the offspring.[6]

Suboptimal maternal nutrition has a negative impact on the health of the offspring

Maternal nutrition may modulate epigenetic processes and metabolic programming during certain crucial moments of the fetal and early postnatal development. Current evidence clearly shows that the effects of various in utero exposures and maternal nutritional status may have different effects on the epigenome.

Maternal nutrition malnourishment may adversely affect long-term health of the offspring, such as increased risk of obesity, insulin resistance, diabetes and adult-onset metabolic syndrome.

References

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