Maternal and paternal dietary quality, dietary inflammation status, and offspring DNA methylation

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Introduction

Maternal diet and chronic inflammation may influence early-life offspring health[1]. Recent evidence suggests that developmental programming may involve epigenetic mechanisms[2]. However, few studies have evaluated the effect of parental dietary quality on offspring DNA methylation.

Objectives

To evaluate associations between the quality and inflammatory potential of parental prenatal diet and offspring DNA methylation at nine years

Methods

Study: The Lifeways Cross-Generation cohort (2001-2003), Ireland

Dietary scores:
Food frequency-questionnaire (mother:1st trimester, father: last year)

- Healthy eating index (HEI-2015)[3]
- Energy-adjusted dietary inflammation (E-DII)[4]

DNA methylation: Saliva samples of **264 children**

- Illumina Infinium HumanMethylationEPIC (EPIC array), measures DNAm at 850K CpG sites

- **Statistical analyses:** Epigenome-wide approach – CpG site level
- **Covariates:** Child sex, batch effect, smoking status, cellular composition
- **Multiple tests:** Bonferroni correction, significance threshold < 6.3×10^{-8}

Results

- **Maternal HEI (N=244)**

CpG ID	Effect size	p-value	Chr	Gene Name
cg21840035	-0.004	5.6e-08	chr17	PLEKHM1

PLEKHM1 gene → Regulation of bone development

- **Paternal HEI (N=127)**

CpG ID	Effect size	p-value	Chr	Gene Name
cg22431767	-0.002	4.1e-08	chr1	LUZP1

LUZP1 gene → Cell signaling

- **Maternal/paternal E-DII**: No significant associations with DNA methylation

Conclusion

- Parental dietary quality in the prenatal period may influence offspring childhood DNA methylation.
- Replication in other populations with contrasted dietary intake is warranted, with a view to informing public health recommendations to benefit the health of future generations.

References

1. Chen et al, Plos Med, 2021
2. Dominguez-Salas et al, Proc Nutr Soc, 2012
3. Navarro et al, Nutrients, 2019
4. Hébert et al, Adv Nutr, 2019