

# Prenatal exposure to maternal smoking linked to offspring's cardio-metabolic health

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According to new research, epigenetic changes found in the offspring exposed to maternal smoking during pregnancy or in current smokers are linked to smoking-related diseases in adulthood.

The study identified lower DNA methylation at GFI1, a compelling smoking-related locus that associates with increased risk for adult BMI, blood lipids and [blood pressure levels](#). This study arose from a large international collaboration between 17 research academic organisations, organised under the Global MethQTL and DynaHEALTH consortia, linking data from Europe, the US and Australia. This collaborative effort from a long lasting cooperation between the University of Oulu (Finland) and Imperial College London (United Kingdom) sheds light on our understanding of the multidimensional components of life-long health and development of chronic diseases. The new findings are published in the journal *EBioMedicine*, published by *The Lancet*.

Cigarette smoking accounts for nearly 6 million deaths annually and even former smokers are at long-term risk of developing cardio-vascular diseases. Similarly, exposure to maternal smoking during pregnancy has undue immediate consequences (low birth weight, pre term birth etc.) as well as predisposing the child to risk for cardio-metabolic risk factors in later life. However, despite the known risk, worldwide 53 percent of women who smoke daily continue to smoke during pregnancy, with the highest prevalence in the European region over the last years.

The mechanisms underlying these long-term effects need better understanding, as they are very likely due to direct biological effects combined with inherited behavioural and psychosocial factors. Previous research has identified many smoking-related epigenetic markers. Epigenetic processes such as DNA methylation essentially regulate gene expression without altering the gene's DNA structure. Changes in gene expression have implications on the development of diseases. This represents the largest study to discover the link between smoking related epigenetic markers and cardio-metabolic risk factors in adults.

For this study, researchers conducted meta-analysis on 22 studies, including methylation data on 18,212 adults aged from 16 to 81 years.

Among these, 17 percent were found to be current smokers. Data since pregnancy was available on 4,230 offspring, of which 18 percent were exposed to maternal smoking during pregnancy. Lower DNA methylation at GFI1 was consistently observed among participants exposed to smoking, and, this molecular biomarker associated with cardio-metabolic risk factors attributed to smoking, including changes in body mass index, blood pressure levels and hypertriglyceridemia.

The findings highlight important clinical implications. Epigenetic changes associate with cardio-metabolic [risk](#) in later life even among non-smokers exposed to pre-natal maternal smoking. "Such epigenetic loci might serve as objective biomarkers of past environmental exposures that could be used for preventive health measures. This discovery provides a strong foundation for further work to unravel emerging smoking epigenetic markers with downstream detrimental health outcomes," says lead author Priyanka Parmar from the University of Oulu.

Professor Marjo-Riitta Järvelin, group leader, points out "Our study shows compelling evidence that changes in epigenetic markers may persist over the life course of an individual. These findings are important for health policy makers to further draw attention towards increasing awareness on [smoking](#) cessation programmes and for better prevention strategies in maternity clinics and health centres."

Dr. Sylvain Sebert, senior author from the University of Oulu highlights "This study also constitutes a proof-of-concept of the developmental and life-course complexity of health. Only 8 (out of 6000) DNA methylation markers associated with prenatal exposure to [maternal smoking](#) were selected for this research. These represent only the tip of the iceberg where much research is needed to understand the molecular interactions, the causal pathways and the modifiable factors."

**More information:** Priyanka Parmar et al. Association of maternal prenatal smoking GFI1-locus and cardio-metabolic phenotypes in 18,212 adults, *EBioMedicine* (2018). [DOI: 10.1016/j.ebiom.2018.10.066](https://doi.org/10.1016/j.ebiom.2018.10.066)

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