

Smoking During Pregnancy May Impact Fetal Growth through Changes in Placental Gene Expression

A new study demonstrates links between maternal smoke, placental DNA methylation and poor birth outcomes

Barcelona, September 9, 2021.- Maternal smoking during pregnancy is associated with **changes in the methylation patterns of placental DNA**, and many of these changes are in turn **associated with poor birth outcomes**, shows a new study co-led by the Barcelona Institute for Global Health (ISGlobal), an institution supported by “la Caixa” Foundation, in collaboration with Emory University, Atlanta. The findings, published in *Nature Communications*, also indicate that these DNA methylation changes in the placenta may affect the expression of genes involved in environmental responses, growth and inflammation, potentially explaining the impact on foetal growth.

In Europe, around one in ten mothers smoke during pregnancy. Therefore, the numerous health effects on the foetus are of significant public health concern. However, the **mechanisms underlying the toxic effects of tobacco smoke** are only partially understood. Environmental exposures may induce epigenetic changes - chemical modifications of the genome that in turn affect gene expression. One of these modifications is **DNA methylation**, which occurs mainly in sites where a **cytosine** is followed by a **guanine** (CpG sites).

In this study, ISGlobal researcher **Mariona Bustamante** and her colleagues aimed to characterise the impact of maternal smoking on the placental epigenome by performing a **meta-analysis of seven independent cohort studies** of the PACE consortium, which included a total of **1700 mother-infant pairs** in **Australia, France, Spain, Canada, and USA**. The meta-analysis identified 433 CpG sites associated with maternal smoking during pregnancy, of which almost half were related to **pre-term birth** and/or **lower size or weight at birth**. The researchers then explored the functional consequences of these associations and found that some of these CpGs are in or near genes involved in responding to environmental stressors, regulating inflammatory activity, signalling through growth factors, and have previously been related to cardiometabolic outcomes. Furthermore, CpGs tend to be close to genetic variants related to birth outcomes. Finally, comparison of the findings to those of a previous meta-analysis performed with cord blood suggests that **there are unique placenta-specific CpG methylation responses to tobacco smoke**.

“The CpG sites, the genes and the pathways identified in this study can help us decipher the mechanisms by which smoking affects placental function and foetal growth,” concludes Bustamante, co-senior author of the study.

Reference

Everson T, Vives-Usano M, Seyve E, et al. ***Placental DNA methylation signatures of maternal smoking during pregnancy and potential impacts on fetal growth.*** Nature Comms. 2021. 12:5095. <https://doi.org/10.1038/s41467-021-24558-y>

About ISGlobal

The Barcelona Institute for Global Health, ISGlobal, is the fruit of an innovative alliance between the "la Caixa" Foundation and academic and government institutions to contribute to the efforts undertaken by the international community to address the challenges in global health. ISGlobal is a consolidated hub of excellence in research that has grown out of work first started in the world of health care by the Hospital Clínic and the Parc de Salut MAR and in the academic sphere by the University of Barcelona and Pompeu Fabra University. Its working model is based on the generation of scientific knowledge through Research Programmes and Groups, and its translation through the areas of Training and Analysis and Global Development. ISGlobal has been named a Severo Ochoa Centre of Excellence and is a member of the CERCA system of the Generalitat de Catalunya.

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