Exposure of pregnant women to chemical pollutants leaves an imprint on their metabolism

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A study performed with the INMA birth cohort and the European HELIX project has revealed reproducible associations between exposure to multiple chemical pollutants and changes in metabolic processes during pregnancy. The results will help researchers to understand how environmental exposures can affect the health of pregnant women and their babies.

Exposure to chemical environmental pollutants during pregnancy may affect child development, even when the exposure levels are low. For example, exposure to polychlorinated biphenyl (PCB) is associated with impaired foetal growth, and methylmercury and organophosphate pesticides affect neurodevelopment. However, in a complex modern chemical environment, it is difficult to identify the effect of single pollutants. In this study, published in *Environmental Science & Technology*, the authors tested the hypothesis that the exposure of pregnant women to low levels of environmental contaminants leaves an imprint on their metabolism.

To do so, they used data from 750 pregnant women (340 from Sabadell, in Catalonia, and 410 from Gipuzkoa, in Basque Country) enrolled in the INMA (Infancia y Medio Ambiente) birth cohort study. To determine their "exposome" (i.e. the totality of chemical exposures), they measured concentrations of 35 chemical exposures in first trimester blood samples, in urine (first and third trimester of pregnancy) and in cord blood. To determine potential changes in metabolism, they measured 65 metabolites from urine samples taken at two time points (first and third trimester) of pregnancy.

The analysis identified novel exposure-metabolite associations that were reproducible across two periods of pregnancy and/or across the two cohorts. In particular, they found a strong and significant association between total arsenic in urine and a small organic metabolite (TMAO) produced by gut bacteria. Arsenic was also associated with homarine, a metabolite widely present in marine invertebrates, but that had never been measured in humans. In fact, the Sabadell mothers had particularly high concentrations of arsenic, as compared to other populations from European countries, Australia and U.S., most probably due to greater seafood consumption. The findings also indicate that tobacco smoke exposure is related to coffee metabolism, and the presence of certain metals in urine was related with steroid hormone byproducts. "Our results are in line with previous reports suggesting that these metals are endocrine disruptors," explains Léa Maitre, first author of the study.

The study findings have epidemiological and

clinical implications. "The observed associations may reflect differences in the in utero environment that could potentially affect foetal development and child health later on," state the authors. They warn however that, while the study demonstrates reproducible interactions between chemical exposures and metabolites, it is difficult to distinguish cause from effect. Furthermore, the consequences of these exposures on the metabolism of the babies was not assessed. "These are issues that we are currently examining with the HELIX (Human Early Life Exposome) Project," adds Maitre.

More information: Léa Maitre et al, Urine Metabolic Signatures of Multiple Environmental Pollutants in Pregnant Women: An Exposome Approach, *Environmental Science & Technology* (2018). DOI: 10.1021/acs.est.8b02215