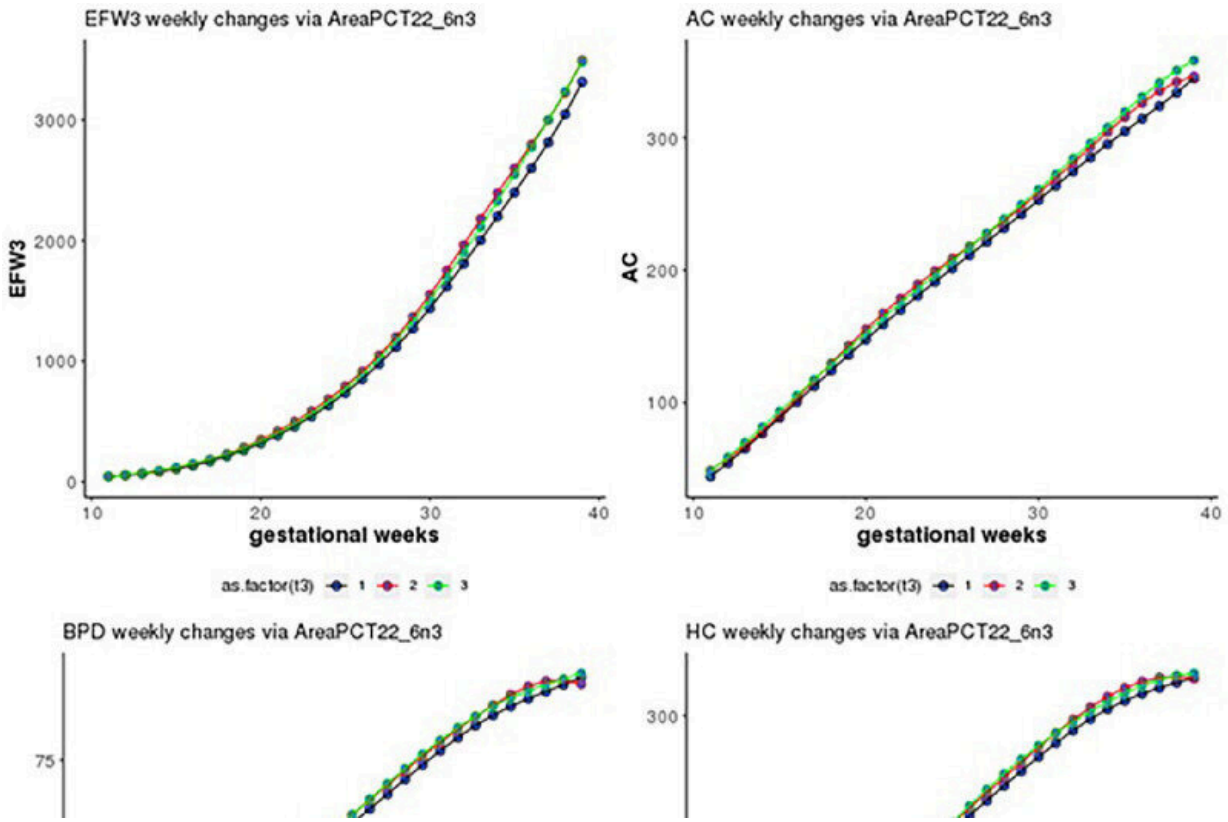
Medical Xpress

Researchers discover potential intergenerational impacts of physical activity and nutrition on placental methylation

August 31 2022



Back-transformed geometric means of EFW by gestational weeks to tertiles of DHA within the NICHD Fetal Growth Studies-Singletons, from 11-39 weeks gestational age. 1st tertile curve is in blue, 2nd tertile curve is in red and 3rd tertile is in green. The shaded area indicated a significant increment of EFW in the 3rd tertile compared with the 1st tertile of DHA. Credit: *eBioMedicine* (2022). DOI: 10.1016/j.ebiom.2022.104180

A healthy diet and active lifestyle may benefit pregnant mothers and their children, as shown in the intergenerational impact of maternal nutrition and lifestyle before and during pregnancy on fetal growth and offspring health. However, the underlying biological mechanisms remain unclear.

Homing in on this, a research team led by Professor Zhang Cuilin, Director of the Global Center for Asian Women's Health, and Professor with the Department of Obstetrics and Gynecology at the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine), in collaboration with investigators from the National Institutes of Health, U.S., has been investigating longitudinal physical activity status and nutrition before and throughout pregnancy with placental DNA methylation and fetal growth.

"We hope to better understand both short-term and long-term health implications of diet and lifestyle on maternal and fetal health, as well as their underlying mechanisms. We aim to identify effective diet and lifestyle intervention strategies to promote the health and well-being of women, their children, and the entire family," Professor Zhang said.

One of Prof Zhang's latest research projects was to investigate maternal physical activity prior to and during pregnancy with intergenerational effects on offspring health through their impacts on placental DNA methylation. Placental DNA methylation, known as a process that regulates gene expression and cellular function in the placenta, has been critical for studying the processes related to fetal and maternal health. The placental DNA methylation pattern is crucial for regulating genes involved in the development of the placenta that affects fetal growth significantly.

With results published in the *American Journal of Clinical Nutrition*, the team identified that recreational physical activity before and during pregnancy was significantly associated with a site of placental DNA methylation region responsible for regulating gene expression, which implied that maternal preconception and antenatal physical activity may impact the fetus' early-life cardiac, immune system, and nervous system development.

Another area of research focus led by Prof Zhang is on maternal nutrition and fetal growth. Her team of researchers recently explored the impact of different types and levels of fatty acids in early pregnancy with subsequent fetal growth throughout pregnancy. In work published in *eBioMedicine*, the team found that most plasma phospholipid poly-unsaturated fatty acids in early pregnancy, such as omega-3 fatty acids (e.g., docosahexaenoic acid (DHA) and alpha-linolenic acid (ALA)), could optimize fetal growth. The beneficial influence could last from early to late pregnancy.

Assistant Professor Queenie Li Lingjun from the Global Center for Asian Women's Health and the Department of Obstetrics & Gynaecology at NUS Medicine says that "findings from our longitudinal study not only provided novel insights into the differential roles of blood PUFAs in fetal development throughout pregnancy, but also determined how soon such effects kicked in and whether the effects lasted through pregnancy. By identifying some PUFAs that can be supplemented through diet, such as DHA, we might offer a potential target using PUFAs in early pregnancy to optimize fetal growth."

More information: Sifang Kathy Zhao et al, Recreational physical activity before and during pregnancy and placental DNA methylation—an epigenome-wide association study, *The American Journal of Clinical Nutrition* (2022). DOI: 10.1093/ajcn/nqac111

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Ling-Jun Li et al, Plasma phospholipid polyunsaturated fatty acids composition in early pregnancy and fetal growth trajectories throughout pregnancy: Findings from the US fetal growth studies-singletons cohort, *eBioMedicine* (2022). DOI: 10.1016/j.ebiom.2022.104180

Provided by National University of Singapore

Citation: Researchers discover potential intergenerational impacts of physical activity and nutrition on placental methylation (2022, August 31) retrieved 16 April 2024 from https://medicalxpress.com/news/2022-08-potential-intergenerational-impacts-physical-nutrition.html

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