ECHO
Environmental influences on Child Health Outcomes
A program supported by the NIH

Study Summary

PFAS Exposure Associated with Changes in Gut Microbiome During Pregnancy

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Who sponsored this study?

The Environmental influences on Child Health Outcomes (ECHO) Program, Office of the Director, National Institutes of Health supported this research.

Why was this study needed?

Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of man-made chemicals that are used in various industrial processes and consumer products, including cookware, stain-resistant fabrics, and foams used to fight fires. PFAS can also build up in the environment, contaminating water, food, and air. Because PFAS can last a long time without breaking down, these chemicals can also build up in biological tissues, including the gut lining. PFAS exposure has previously been linked to diseases of the cardiovascular, immune, endocrine, reproductive, and metabolic systems.

Recent studies have shown that PFAS exposure may affect a person's gut microbiome, the ecosystem of bacteria and other microbes that live in the gut. The composition of the gut microbiome is dependent on a variety of factors, including diet, lifestyle, and exposure to environmental chemicals. These microbes often help aid digestion, support immune health, or protect against pathogens. Changes in the maternal microbiome may impact multiple pregnancy health outcomes related to metabolism and inflammation. Therefore, it is important to identify environmental factors that may affect microbiome health during pregnancy.

What were the study results?

In both sites, prenatal PFAS exposure did not have a significant effect on the diversity of microbes in the maternal gut microbiome. However, the study found there was a significant association between prenatal PFAS exposure and the relative abundance of specific types of bacteria in the maternal gut microbiome. Associations between PFAS exposure and gut microbiome varied by study site, with certain types of bacteria being site-specific and not shared between the Michigan and Atlanta sites.

What was the study's impact?

The effect of PFAS exposure on maternal gut microbiome composition may have broader implications for the health of both the mother and baby. Decreasing exposure to pollutants such as PFAS can improve health outcomes, but complimentary interventions focused on improving microbiome health and resiliency may also help to combat the health effects of environmental chemicals.

Who was involved?

The study included 162 pregnant participants from ECHO study sites in Atlanta and Michigan. The Michigan site (Michigan Archive for Research on Child Health Cohort) included 61 predominantly non-Hispanic White (90.2%) participants. The Atlanta site (Atlanta African American Maternal Child Cohort) included 101 participants who self-identified as Black or African American (100%).

What happened during the study?

Researchers measured PFAS exposure during early or late pregnancy. Later in pregnancy, researchers collected microbiome samples from the mother's stool to evaluate the types of bacteria present and the bacterial diversity. Statistical methods were used to understand the relationship between PFAS exposure and microbiome composition and diversity.

Footnote: Results reported here are for a single study. Other or future studies may provide new information or different results. You should not make changes to your health without first consulting your healthcare professional.

What happens next?

Future studies could help researchers understand how these microbiome changes are related to maternal and child health outcomes.

Where can I learn more?

Access the full journal article, titled "Prenatal PFAS exposure and outcomes related to microbiome composition and diversity in later pregnancy," in *Environmental Research*.