



Study Summary

ECHO Cohort Study Finds Association Between PFAS and Bioactive Lipids

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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 large, complex group of synthetic chemicals that have been used in consumer products around the world since about the 1950s. They are ingredients in various everyday products. For example, PFAS are used to keep food from sticking to packaging or cookware, make clothes and carpets resistant to stains, and create firefighting foam that is more effective. People are most likely exposed to these chemicals by consuming PFAS-contaminated water or food, using products made with PFAS, or breathing air containing PFAS.

Because PFAS break down slowly, if at all, people and animals are repeatedly exposed to them, and blood levels of some PFAS can build up over time. Scientific studies have identified multiple health effects associated with [PFAS exposure](#).¹ Women exposed to PFAS during pregnancy are at increased risk for adverse birth outcomes and pregnancy complications.

Lipids are fatty molecules that perform a variety of functions in the body—from forming the membranes of cells to serving as a building block for certain hormones. Changes in bioactive lipids—broadly defined as a category of lipids with signaling properties that cause biological effects and changes in the body—have been linked to PFAS exposure and adverse pregnancy outcomes. This study aimed to compare the concentration of PFAS in the blood of pregnant participants with levels of bioactive lipids in three important metabolic pathways.

What were the study results?

The research team analyzed the associations between 12 types of PFAS, in pairs and as mixtures, and 50 bioactive lipids in blood plasma in pregnant participants across three ECHO Cohort Study Sites. When researchers looked at data from different study sites, they found that higher levels of PFAS in blood were often linked with higher levels of certain bioactive lipids. The research team also noticed differences in the distribution of bioactive lipid compounds between individual study sites, possibly

¹ [National Institute of Environmental Health Sciences: Perfluoroalkyl and Polyfluoroalkyl Substances \(PFAS\) \(nih.gov\)](https://www.niehs.nih.gov/health/topics/agents/pfas/)

driven by variations in the genetic makeup and sociodemographic characteristics of the populations or differences in environmental exposures due to diet.

Footnote: Results reported here are for a single study and reflect an observed correlation. Other or future studies may provide new information or different results. You should always consult with a qualified healthcare provider for diagnosis and for answers to your personal questions.

What was the study's impact?

The similarity of results researchers found from the analysis of mixtures of PFAS chemicals and individual PFAS chemicals indicate that specific bioactive lipids could be useful biomarkers of PFAS exposure. Biomarkers are biological indicators of a particular health effect or status – in this case, PFAS exposure. They can be found in blood, urine, or other body fluids and can be substances, characteristics, genes, or proteins. This insight could help in understanding and addressing the health effects of PFAS by expanding screening methods.

The bioactive lipids measured in this study have not yet been tested as routine biomarkers in clinical settings. However, these findings aid in advancing the future of healthcare as additional and more complex lipid biomarkers become measurable and are tested for clinical use.

These findings encourage researchers to prioritize the study of PFAS and bioactive lipids pairs in future testing in addition to individually studying the effect of different types of PFAS. Additionally, this study highlights the importance of regulating the 12 types of PFAS observed.

Who was involved?

This study included 414 pregnant participants from three ECHO Cohort study sites: Chemicals in Our Bodies based in San Francisco, ECHO-PROTECT based in Puerto Rico, and Illinois Kids Development Study based in Chicago.

What happened during the study?

The research team estimated associations between prenatal PFAS exposure and bioactive lipids, measuring the levels of 12 types of PFAS and 50 bioactive lipids in 414 pregnant participants. Researchers quantified associations by using various statistical analyses while controlling for several factors (e.g., maternal age, gestational age at sample collection, maternal education, pre-pregnancy BMI).

What happens next?

The researchers plan to measure associations between bioactive lipids and peri- and prenatal mental health outcomes including perinatal and postpartum depression. Future studies could also look at the influence of other variables on this relationship. For example, researchers could investigate the influence of diet, which has been linked to changes in both PFAS and bioactive lipid concentrations.

Where can I learn more?

Access the full journal article, titled “Cross-Sectional Associations between Prenatal Per- and Poly-Fluoroalkyl Substances and Bioactive Lipids in Three Environmental Influences on Child Health Outcomes (ECHO) Cohorts,” in [Environmental Science and Technology](#).

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