PFAS Levels in Mothers' Blood Associated with Children's Brain Structure and Function

FINLAND, October 13, 2025 /EINPresswire.com/ -- Researchers from the University of Turku and Turku University Hospital, Finland, and Örebro University, Sweden, have discovered that the levels of PFAS in mothers' blood during pregnancy is associated with their children's brain structure and function.

> It's unclear whether PFAS directly affect brain development, although it's known that they pass the placenta and blood-brain barrier to accumulate in the brain, and can disturb developing brain cells."
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> *Professor Hasse Karlsson*

In recent years, researchers have found associations between the levels of per- and polyfluoroalkyl substances (PFAS) in mothers' blood during pregnancy, and their children's neurodevelopmental outcomes. A recent study led by the University of Turku, Finland, expands on this by demonstrating that maternal PFAS predict their children's brain structural and functional outcomes.

PFAS are man-made chemicals used in manufacturing products resistant to water, oil, temperature, or electrical conductivity, such as cooking utensils, clothes, furniture, food packaging, flooring, dental floss, and firefighting foams. Similar to plastics, they are non-biodegradable, and have been nicknamed "forever chemicals" for this reason. They are now found in all ecosystems on earth, and their presence in the soil is estimated to last for over 1,000 years.

"Humans consume PFAS from drinking water, food, or in some cases exposure through occupation. They are ubiquitous in our blood, and our bodies do not break them down," says Senior Researcher Aaron Barron from the University of Turku, the lead author of the study.

Over the last decade, accumulating research has implicated blood PFAS levels in adverse health outcomes, especially hormone biosynthesis, metabolism, and immune system function. For this reason, PFAS have begun to attract a considerable amount of public, political, and academic interest, and are now being increasingly regulated in manufacturing and water supplies.

Different PFAS Were Associated with Different Brain Regions

The new study was set within the FinnBrain Birth Cohort Study, a longitudinal birth cohort established at the University of Turku in 2011. Some of the mothers donated a blood sample

during pregnancy, and their blood PFAS levels were measured by mass spectrometry at Örebro University in Sweden. Their children came back for a follow-up visit at 5 years old, and they underwent multimodal magnetic resonance brain imaging at Turku University Hospital. The final analysis included 51 mother–child pairs.

The researchers found that maternal PFAS were linearly associated with many aspects of their children's brain structure. The three main brain regions involved were the corpus callosum, the brain's largest white matter tract; the surface area and volume of the posterior grey matter volume, in the occipital lobe; and the hypothalamus, which regulates our body's homeostasis and endocrine function. None of the associations were any different in boys and girls. Additionally, some PFAS were associated not only with brain structure, but also brain functional connectivity based on functional MRI scans.

"We were able to measure seven different PFAS in this study, and found that individual compounds had specific associations with offspring brain structure, and in some cases two different PFAS had opposite relationships with the same brain region," explains Professor Tuulia Hyötyläinen from Örebro University. The PFAS could be divided into two groups based on their chemical structure – whether they contain a carboxylic acid or a sulphonic acid functional group. In most cases, except for in the hypothalamus, the carboxylate-containing PFAS were the ones that were more strongly associated with brain outcomes in children.

"At the moment, it is unclear whether PFAS are directly affecting brain development, although it's known that they pass the placenta and the blood-brain barrier to accumulate in the brain, and can disturb developing brain cells. It's also unclear whether these associations are harmful, beneficial, or neutral, and future studies will be needed to determine the functional implications of our findings," explains Professor Hasse Karlsson from the University of Turku.

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