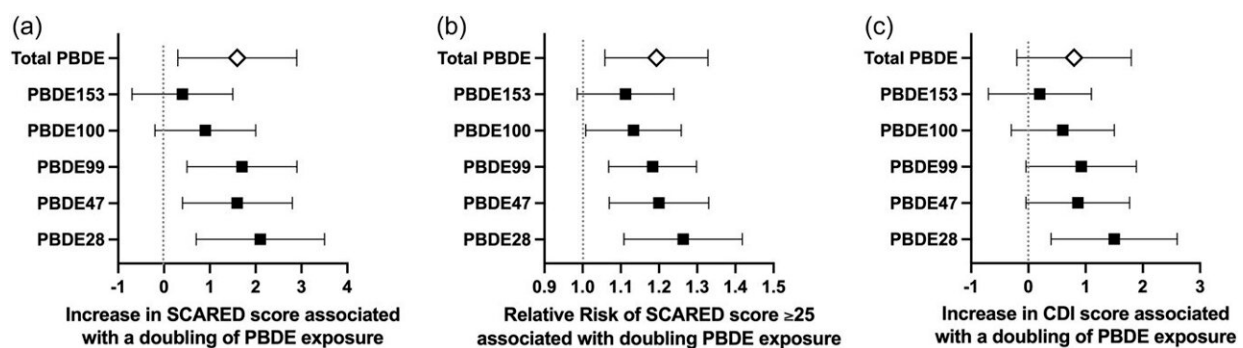


In utero exposure to flame retardants increases anxiety symptoms, new research finds

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Maternal serum polybrominated diphenyl ether concentrations and Internalizing Symptoms at 12 Years. Anxiety (a, b) and depressive (c) symptoms are reflected by the total scores on the child-reported Screen for Child Anxiety and Related Emotional Disorders (SCARED) scores and the Children's Depression Inventory (CDI). Analysis of anxiety symptoms is adjusted for child sex, maternal age, marital status, education, income at 12-year visit, maternal Symptom Checklist-90-R anxiety score, and relational frustration score while analysis of depressive symptoms is adjusted for maternal age, marital status, education, income at 12-year visit, relational frustration score, and maternal Symptom Checklist-90-R depression score. Credit: *Depression and Anxiety* (2022). DOI: 10.1002/da.23284

New research led by the University of Cincinnati and Cincinnati Children's Hospital Medical Center sheds light on the connection

between exposure to environmental toxins in utero and the later development of anxiety during adolescence.

Lead author Jeffrey Strawn, MD, and his colleagues recently published the study in the journal *Depression and Anxiety*.

Strawn said researchers are increasingly interested in learning more about risk factors for [anxiety](#) and depression in children, particularly since there has been a surge of these symptoms during the pandemic. Even prior to the pandemic, anxiety disorders were among the most prevalent and earliest presenting mental health conditions for children, he said.

"We know a lot about early risk factors, including psychological [risk factors](#), temperament, behaviors and [family relationships](#)," said Strawn, professor in the Department of Psychiatry and Behavioral Neuroscience in UC's College of Medicine and a UC Health child and adolescent psychiatrist. "But we know incredibly little about the effects of environmental factors like air pollution and other environmental toxicants on anxiety."

The study focused on a class of chemicals called polybrominated diphenyl ethers (PBDEs) that were used as flame retardants for products like furniture foam padding, insulation, rugs, upholstery, computers and appliances. Exposure to PBDEs during [early brain development](#) has been associated with cognitive deficits, reduced [language skills](#) and attention-deficit/[hyperactivity disorder](#), and the chemicals were banned in the United States in 2004.

Despite the ban, Strawn said exposure to PBDEs remains common, but its effect on anxiety symptoms had not been previously studied.

"One of the things that we know is that brain development starts

relatively early in utero," he said. "We wanted to look at how different exposures at different points in a pregnancy impact [brain development](#) and how that potentially translates to a risk for anxiety or depression symptoms, which we know tend to manifest a bit later. The idea is to look at what is the earliest risk factor that we can really identify."

The researchers used data from the Health Outcomes and Measures of the Environment (HOME) study, which was designed to measure the impact of fetal and early childhood exposures to environmental toxicants like lead, mercury, pesticides, PBDEs and more. The study enrolled 468 [pregnant women](#) in the Greater Cincinnati region from 2003-2006 and continued to follow up with their children up to 12 years later.

"We have this ongoing sample with lots of data about the moms and specifically about their environmental exposures in terms of blood that was obtained during their pregnancy," Strawn said. "What we did is look at the relationship between exposure to those different environmental chemicals, specifically flame retardants, and that subsequent risk of developing anxiety or having anxiety symptoms."

A total of 236 adolescents from the HOME study were given self-reporting anxiety and depression screenings around the age of 12.

The study found that each time the PBDE levels doubled in a pregnant mother's blood sample was associated with increased anxiety scores in the adolescents, suggesting PBDE exposure during pregnancy may be a risk factor for developing anxiety symptoms in early adolescence.

Strawn said it is important to note that an increase in anxiety symptoms does not necessarily correlate with the adolescents developing [anxiety disorders](#), but PBDE exposure across an entire population could still have a large impact.

"When you look at a [population level](#) and you see the effect of these ubiquitous chemicals increasing your baseline anxiety by 10% or 20%, that's really significant across the whole population," Strawn said. "That increase in anxiety across a population means that many individuals may cross the line between having manageable anxiety and having an anxiety disorder."

Moving forward, Strawn said further research will aim to understand what brain regions are being affected by PBDE exposure and if there are certain time periods in pregnancy that are more closely associated with the increased anxiety risk. Work will also continue in improving clinical interventions and working to minimize PBDE exposure.

More information: Jeffrey R. Strawn et al, Early exposure to flame retardants is prospectively associated with anxiety symptoms in adolescents: A prospective birth cohort study, *Depression and Anxiety* (2022). [DOI: 10.1002/da.23284](https://doi.org/10.1002/da.23284)

Provided by University of Cincinnati

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