Prenatal Exposure to One Type of PFAS Linked to Small Differences in Children's Sleep

Authors: Cai Zhang, Sarah Geiger, et al.

KEY TAKEAWAYS:

- Children whose mothers had higher levels of perfluorooctanoic acid (PFOA) during pregnancy tended to have slightly more sleep problems between ages 1 and 5.
- Other per- and polyfluoroalkyl substances (PFAS) studied were not clearly linked to children's sleep problems.

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?

PFAS are long-lasting chemicals found in many consumer and industrial products, including nonstick cookware, food packaging, stain-resistant materials, and firefighting foam. These chemicals can stay in the environment and in people's bodies for a long time. During pregnancy, PFAS can cross the placenta, meaning a baby may be exposed before birth.

Sleep is important for young children's growth, learning, behavior, and emotional health. Some earlier studies suggested that PFAS exposure during pregnancy might be linked to children's sleep, but large studies following children across early childhood have been limited. This study uses data from the nationwide ECHO Cohort to better understand whether prenatal exposure to four PFAS chemicals was associated with sleep problems in children ages 1 to 5.

What were the study results?

Higher levels of PFOA during pregnancy were associated with slightly higher sleep problem scores in young children. This means children whose mothers had higher PFOA levels during pregnancy tended to have somewhat poorer sleep quality between ages 1 and 5. This association was seen in both boys and girls.

The other three PFAS chemicals studied were not clearly linked to children's sleep problems. Children exposed to perfluorooctanesulfonic acid (PFOS) and perfluorononanoic acid (PFNA) tended to have slightly more sleep problems, while those exposed to perfluorohexane sulfonic acid (PFHxS) tended to have slightly fewer. None of the associations were strong enough to confirm a link.

What was the study's impact?

The sleep score differences linked with PFOA exposure were small for any one child. However, PFAS exposure is common, so even small changes could matter across a large population. Because sleep problems in early childhood can affect behavior, emotional regulation, learning, and family routines, the study authors suggest that reducing PFAS exposure during pregnancy may support children's sleep health and overall development.

Who was involved?

The study included 2,836 mother–child pairs from 14 ECHO Cohort study sites across the United States and Puerto Rico. The children contributed 4,451 sleep assessments between ages 1 and 5. The study sample included families from a range of racial, ethnic, educational, and income backgrounds.

What happened during the study?

Researchers measured levels of four PFAS chemicals in blood samples collected from mothers during pregnancy. The chemicals included PFOA, PFOS, PFNA, and PFHxS. When more than one pregnancy blood sample was available, the researchers averaged the measurements to estimate overall prenatal exposure.

Caregivers later reported on children's sleep using the Child Behavior Checklist Sleep Problems scale. This questionnaire asks about common sleep-related behaviors, such as trouble falling asleep, waking often during the night, nightmares, and resistance at bedtime. Researchers compared children's sleep scores with their mothers' PFAS levels during pregnancy while accounting for other factors that could affect sleep, such as maternal age, education, race and ethnicity, pre-pregnancy body mass index, smoking during pregnancy, study site, birth year, and child age at assessment.

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.

Where can I learn more?

Access the full journal article, titled "Prenatal PFAS exposure and early childhood sleep quality in the ECHO Cohort," in *Environmental Research*.

The content is the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.