

Fluoride exposure during pregnancy linked to increased risk of childhood neurobehavioral problems, study finds

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Nearly three-quarters of the United States population receives drinking water that contains fluoride, a practice that began in 1945 to help

prevent tooth decay. But recent studies suggest that fluoride exposure can cause harm to a fetus if consumed during pregnancy, a critical period for brain development.

A new study, led by researchers at the Keck School of Medicine of USC analyzed more than 220 mother-child pairs, collecting data on [fluoride levels](#) during pregnancy and [child behavior](#) at age three. The researchers found that a 0.68 milligram per liter increase in fluoride exposure was associated with nearly double the chance of a child showing neurobehavioral problems in a range considered close to or at a level to meet the criteria for clinical diagnosis.

The findings were published in [JAMA Network Open](#).

"Women with higher fluoride exposure levels in their bodies during pregnancy tended to rate their 3-year-old children higher on overall neurobehavioral problems and internalizing symptoms, including emotional reactivity, anxiety and somatic complaints," said Tracy Bastain, Ph.D., an associate professor of clinical population and public health sciences and senior author of the study.

These population-level findings add to existing evidence from animal studies showing that fluoride can harm neurodevelopment, as well as data from studies conducted in Canada, Mexico and other countries showing that prenatal exposure to fluoride is linked with a lower IQ in early childhood.

The researchers hope the new findings help convey the risks of fluoride consumption during pregnancy to policymakers, health care providers and the public.

"This is the first U.S.-based study to examine this association. Our findings are noteworthy, given that the women in this study were

exposed to pretty low levels of fluoride—levels that are typical of those living in fluoridated regions within North America," said Ashley Malin, Ph.D., an assistant professor of epidemiology at the University of Florida's College of Public Health and Health Professions and College of Medicine and lead author of the present study.

Malin conducted the research in part as a postdoctoral scholar at the Keck School of Medicine.

Tracking emotions and behavior

Data for the study came from the [Maternal and Developmental Risks from Environmental and Social stressors \(MADRES\) Center for Environmental Health Disparities](#) at the Keck School of Medicine.

MADRES follows predominantly Hispanic families in Los Angeles from pregnancy throughout childhood.

"The overall goal of MADRES is reducing the effects of environmental contaminants on the health and well-being of marginalized communities," said Bastain, who co-directs MADRES.

The researchers analyzed 229 [mother-child pairs](#), calculating fluoride exposure from [urine samples](#) collected during the third trimester of pregnancy. Most urine samples were collected from fasting women, which improves the accuracy of chemical testing. Children were then assessed at age three using the Preschool Child Behavior Checklist, which uses parent reports to measure a child's social and emotional functioning.

Children exposed to an additional 0.68 milligrams per liter of fluoride in the womb were 1.83 times more likely to show behavioral problems considered to be clinically significant or borderline clinically significant. Specifically, children exposed to more fluoride had more problems with

emotional reactivity, somatic complaints (such as headaches and stomachaches), anxiety and symptoms linked to autism.

No association was found with several other neurobehavioral symptoms, including "externalizing behaviors" such as aggression and attention problems.

Impact on the U.S. population

Currently, no official recommendations exist for limiting fluoride consumption during pregnancy, but the researchers hope these findings can help stimulate change.

"There are no known benefits to the fetus from ingesting fluoride," Malin said. "And yet now we have several studies conducted in North America suggesting that there may be a pretty significant risk to the developing brain during that time."

Next, the research team will explore how exposure to fluoride during pregnancy may impact brain development among infants in the MADRES study. Additional studies in other regions of the country can also help determine the extent of the problem and the best way forward, Bastain said.

"While this is the first U.S.-based study of fluoride exposure during [pregnancy](#), more studies are urgently needed to understand and mitigate the impacts in the entire U.S. population," she said.

More information: Maternal Urinary Fluoride and Child Neurobehavior at Age 36 Months, *JAMA Network Open* (2024). [DOI: 10.1001/jamanetworkopen.2024.11987](https://doi.org/10.1001/jamanetworkopen.2024.11987)

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