ECHO
Environmental influences on Child Health Outcomes
A program supported by the NIH

Study Summary

Exposure to Metals During Pregnancy May Be Linked to Autism-Related Traits in Children

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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?

Metals such as lead, mercury, and cadmium — which people may be exposed to through sources like food, air, water, tobacco smoke, and some consumer products — can affect a child's developing brain. During pregnancy, some metals that mom is exposed to can cross the placenta and reach the fetus. Past research has suggested possible links between metal exposure and autism spectrum disorder (ASD), but findings have been mixed. Many studies also looked at only one metal at a time, even though people may be exposed to several different metals during their daily life. ECHO researchers wanted to know whether exposure to certain metals during pregnancy was associated with autism-related traits or an ASD diagnosis in children.

What were the study results?

Overall, higher levels of some metals measured in mothers' blood during pregnancy were linked to slightly more autism-related traits in children. Higher blood lead and blood mercury levels were associated with higher scores on a standardized questionnaire that measures social and behavioral traits related to autism (the Social Responsiveness Scale, Second Edition, or SRS-2). Higher blood cadmium was associated with higher odds that a child received an ASD diagnosis. When researchers looked at mixtures of metals, higher combined levels of four blood metals (arsenic, cadmium, mercury, and lead) were linked to higher scores in certain areas or autism-related traits, especially thinking and social awareness. Most metals measured in urine were not associated with SRS-2 scores after accounting for other factors, although one urine metal (barium) showed a stronger link among girls than boys to children's interest in social interaction.

What was the study's impact?

This study adds to evidence that prenatal exposure to certain metals and mixtures of metals may be linked to autism-related traits in children. However, the results do not prove that metal exposure during pregnancy causes ASD or autism-related traits. Many factors influence child development, and the differences in SRS-2 scores in this study were generally small.

Who was involved?

Researchers used data from mother-child pairs at eight ECHO Cohort Study Sites. The analyses included 479 pairs with prenatal blood metal measurements and 482 pairs with prenatal urine metal measurements.

What happened during the study?

During pregnancy, mothers provided blood and/or urine samples that were later tested for metals. Researchers examined concentrations of four metals in blood (arsenic, cadmium, lead, and mercury) and several metals in urine (including arsenic, barium, copper, mercury, and zinc). Caregivers completed the SRS-2 questionnaire on behalf of their children, which measures social communication and related behaviors that are commonly associated with autism. Researchers also collected information on ASD diagnoses when available. The team used statistical methods to examine whether higher metal levels were linked to higher SRS-2 scores or higher odds of ASD, while accounting for factors such as study site, maternal age, income, education, smoking exposure, and child sex. They also looked at metals as mixtures and tested whether associations differed for girls and boys.

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.

What happens next?

Future studies may include larger groups of participants to better understand which metals—and which combinations of metals—may matter most during pregnancy. Researchers also want to measure different types of metals and collect samples throughout pregnancy to better capture exposure over time.

Where can I learn more?

Access the full journal article, titled “Associations of prenatal metal exposures with autism-related outcomes in the ECHO Cohort,” published in *Environmental Epidemiology*.

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