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Study offers new insights into how metal exposures can impact fetal growth

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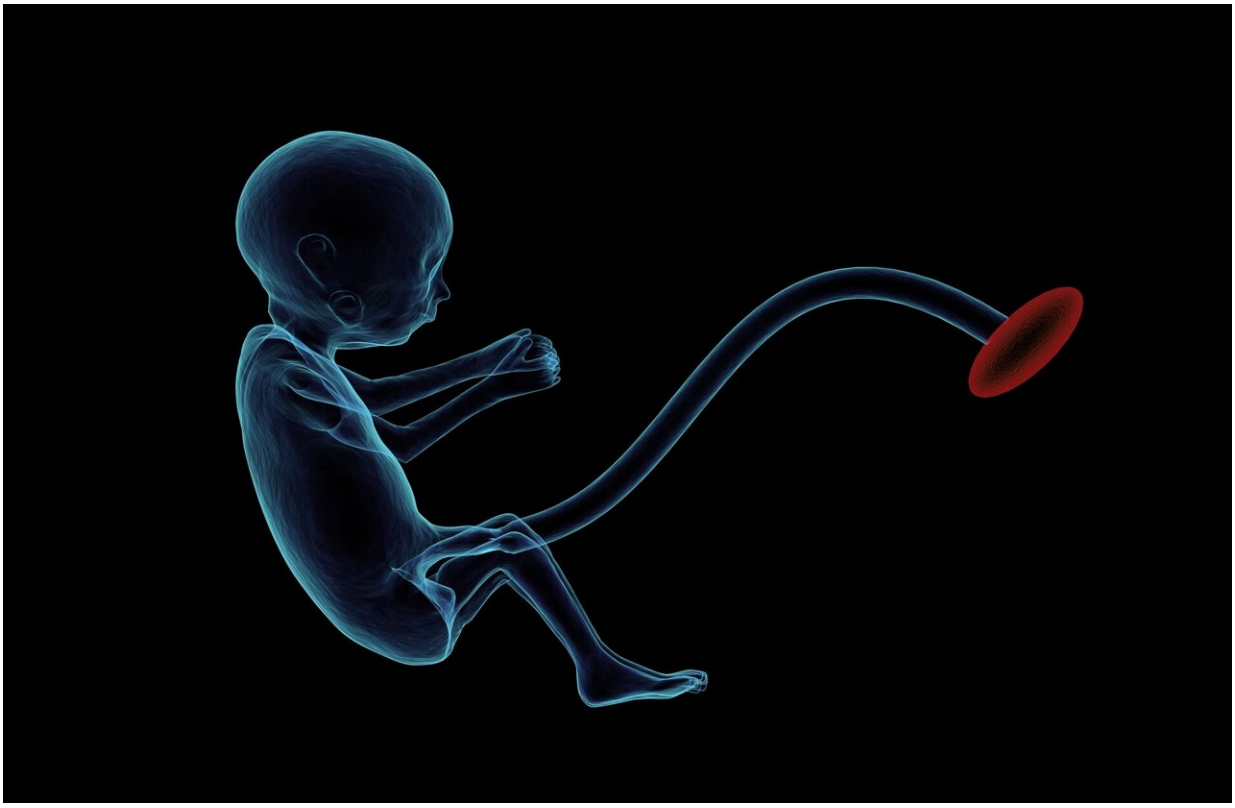

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A new Dartmouth-led study, published in the journal *Environmental International*, reveals how prenatal exposure to mixtures of commonly found metals can adversely affect fetal growth.

Fetal growth is linked to future health—infants who are born small for their gestational age experience greater rates of neonatal mortality and are at a higher risk of developing neurocognitive impairment in childhood and cardiometabolic disease later in life.

A growing number of studies have established that toxic metals, coming from sources such as contaminated food and drinking water and polluted air and dust, are prevalent in the environment, and many of these metals can cross the placenta or alter placental function, contributing to reduced fetal growth.

But prior research looking at metal impacts on fetal growth have typically looked at one metal at a time and within an individual population.

"The limitation of that is usually we're exposed to a complex mixture of multiple metals simultaneously that might interact with each other, and exposure ranges can be narrow in just one population for a given metal," explains lead author Caitlin Howe, Ph.D., an assistant professor of epidemiology at Dartmouth's Geisel School of Medicine whose research focuses on toxic metal exposures and their impacts on maternal and child health.

"So, our goal was to look across multiple diverse populations with different types of exposures, so we could get a better sense of the full dose response relationship for some of these chemicals in the context of the larger mixture," she says.

To accomplish this, the researchers conducted an environmental mixture analysis of metal impacts on fetal growth, pooling data from three geographically and demographically diverse groups in the U.S. The groups, located in New Hampshire, Los Angeles, and Puerto Rico, participate in the Environmental Influences on Child Health Outcomes

(ECHO) Program—a nationwide research program supported by the NIH that studies the effects of a broad range of early environmental influences on child health and development.

Using a novel statistical approach that can account for complex mixtures of pollutants, the investigators examined associations between seven commonly found metals (antimony, cadmium, cobalt, mercury, molybdenum, nickel, and tin) measured in 1,002 maternal urine samples that were collected during pregnancy, and birthweight for gestational age. They also investigated potential differences between groups and the sex of the infants.

"Our most consistent finding was that antimony, an understudied metal, was associated with lower birthweight for gestational age across all three of the groups and in both males and females, suggesting that it may adversely impact fetal growth," says Howe. "So, that's an element where we would want to identify what the main sources of exposure are so that we can help reduce that exposure to prevent harmful effects on fetal growth in these different populations."

For example, the higher antimony concentrations observed in the Los Angeles and Puerto Rico groups may be due to their urban locations, as traffic-related air pollution from brake wear and tear is known to be an important source of antimony exposure, as are smelting and coal-fired plants and waste incinerators. In contrast, bottled water may be a relevant source of antimony exposure for all three groups.

While the researchers did identify some group- and/or sex-dependent associations for many of the other metals studied, says Howe, they lacked the consistency that was seen for the antimony results and therefore merit further investigation.

"Our hope is that we can do a larger study in the future that includes

more cohorts, so that we can look further into what's driving those inconsistencies and better understand the potential differences due to geography or other population characteristics," says Howe.

More information: Caitlin G. Howe et al, Prenatal metal(loid) mixtures and birth weight for gestational age: A pooled analysis of three cohorts participating in the ECHO program, *Environment International* (2022). DOI: 10.1016/j.envint.2022.107102

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