

Association between elevated levels of lead, cadmium and delayed puberty in girls

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Researchers at the National Institutes of Health and other institutions have found that exposure to lead in childhood may delay the onset of puberty in young girls, with higher doses increasing the chance for later maturation.

The researchers analyzed data on blood drawn from more than 700 [girls](#) ages 6 to 11. They found that girls with elevated levels of lead (at or above five micrograms of lead per deciliter of blood) were 75 percent less likely than girls with low levels of lead to have key adolescent hormones at levels that are associated with the beginning of puberty. In girls with elevated levels of both lead and cadmium, this pattern was even more pronounced.

The researchers speculate that lead, alone or in concert with cadmium, might suppress the ovary's production of hormones that prepare a young girl's body to ovulate, or release an egg, for the first time.

Previous studies have shown that exposure to such [heavy metals](#) can disrupt normal hormone patterns or, in some cases, reproductive development. The Centers for Disease Control and Prevention advise treatment for [lead exposure](#) at levels exceeding 10 micrograms of lead per deciliter of blood ([ephtracking.cdc.gov/showChildh...LeadPoisoning.action](#)), but the study authors believe their findings suggest that lead exposure may have harmful effects at even lower levels.

"Our findings suggest childhood exposure to lead has worrisome effects as children age and reach adolescence," said lead first author Audra L. Gollenberg, Ph.D., a fellow at the NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), where the research was conducted. "These issues are of concern in some parts of the United States as well as in countries where children are exposed to leaded gasoline, paint or industrial pollutants."

According to the U.S. [Environmental Protection Agency](http://www.epa.gov/lead/), the most common sources of lead exposure are deteriorating lead-based paint, lead contaminated dust, and lead contaminated residential soil (www.epa.gov/lead/).

Gollenberg worked with NICHD colleagues Mary L. Hediger, Ph.D., and Germaine M. Buck Louis, Ph.D., Peter A. Lee, M.D., of Penn State College of Medicine, Hershey, Pa. and John H. Himes, Ph.D., M.P.H., of the University of Minnesota School of Public Health, Minneapolis.

Their findings appear in *Environmental Health Perspectives*, published by the National Institute of Environmental Health Sciences.

The researchers worked with data on blood and urine samples taken as part of the Third National Health and Nutrition Examination Survey between 1988 and 1994. They compared levels of lead and cadmium to levels of the reproductive hormone inhibin B, an indicator of the development of previously dormant egg cells in the ovaries. Inhibin B is known to increase steadily before the start of puberty.

Designating a specific threshold level for inhibin B, which indicated puberty, the researchers calculated the likelihood that girls with low, medium, or high levels of exposure to lead would reach that threshold. For all age groups, the researchers found that girls with higher blood levels of lead had reduced levels of inhibin B, and so were less likely to

reach the threshold. High levels of lead and cadmium together were even more likely to be associated with low levels of inhibin B. (Cadmium levels of .27-3.7 nanograms per milliliter of urine were considered to be high.) According to the [Centers for Disease Control and Prevention](#), cadmium damages the kidneys, lungs and bones and increases the risk for cancer. Breathing cigarette smoke is a principal source of cadmium exposure (www.atsdr.cdc.gov/tfacts5.html).

In addition, the findings suggested the pubertal delay associated with lead was more prevalent in girls with iron deficiencies. Girls with even moderate levels of lead and low iron levels were much less likely to have reached the inhibin B threshold levels indicating puberty than their counterparts with low lead exposure and normal iron levels.

"Iron deficiency appears to be a critical factor in the context of lead exposure," Dr. Gollenberg said. "Health care providers may wish to pay particular attention to the importance of screening for iron deficiency among girls at high risk for exposure to [lead](#)."

Provided by National Institutes of Health

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