New study links high levels of cadmium, lead in blood to pregnancy delay

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Higher blood levels of cadmium in females, and higher blood levels of lead in males, delayed pregnancy in couples trying to become pregnant, according to a study by researchers at the National Institutes of Health and other academic research institutions.

Cigarette smoke is the most common source of exposure to cadmium,, a toxic metal found in the earth's crust, which is used in batteries, pigments, metal coatings and plastics. Smokers are estimated to have twice the levels of cadmium as do non-smokers. Exposure also occurs in workplaces where cadmium-containing products are made, and from the air near industrial facilities that emit cadmium. Airborne cadmium particles can travel long distances before settling on the ground or water. Soil levels of cadmium vary with location. Fish, plants, and animals absorb cadmium from the environment, and all foods contain at least low levels of the metal.

Lead, a toxic metal also found in the earth's crust, is used in a variety of products, such as ceramics, pipes, and batteries. Common sources of lead exposure in the United States include lead-based paint in older homes, lead-glazed pottery, contaminated soil, and contaminated drinking water.

Exposure to these metals is known to have a number of effects on human health, but the effects on human fertility have not been extensively studied, especially when studying both partners of a couple.

The study was published online in *Chemosphere*. The study's principal investigator was Germaine M. Buck Louis, Ph.D., director of the Division of Epidemiology, Statistics, and Prevention Research at the NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD). Other authors of the study were from the NICHD, the Texas A&M Health Science Center School of Rural Public Health, College Station; The Ohio State University College of Medicine, Columbus; The EMMES Corp. in Rockville, Md.; the National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta; and the Rollins School of Public Health at Emory University, Atlanta.

"Our results indicate that men and women planning to have children should minimize their exposure to lead and cadmium," Dr. Buck Louis said. "They can reduce cadmium exposure by avoiding cigarettes or by quitting if they are current smokers, especially if they intend to become pregnant in the future. Similarly, they can take steps to reduce their exposure to lead based paints, which may occur in older housing, including during periods of home renovation."

To conduct the study, the researchers enrolled 501 couples from four counties in Michigan and 12 counties in Texas, from 2005 to 2009. The women ranged from 18 to 44 years of age, and the men were over 18. Couples provided blood samples for the analysis of three heavy metals. Women kept journals to record their monthly menstrual cycles and the results of home pregnancy tests. The couples were followed until pregnancy or for up to one year of trying.

The researchers ranked the study participants on the basis of their blood levels of lead and cadmium. The researchers also measured the participants' blood mercury levels, but found they were not associated with the length of time couples required to become pregnant. Nearly every study participant had some exposure to these common metals, although blood levels of the metals varied across participants.

Researchers calculated the probability that a couple would achieve pregnancy by levels of blood cadmium and lead with a statistical measure called the fecundability odds ratio. The measure estimates

couples' probability of pregnancy each cycle, by their blood concentration of metals. A ratio less than one suggests a longer time to pregnancy, while a ratio greater than one suggests a shorter time to pregnancy. Females' blood cadmium concentration was associated with a ratio below 1 (0.78), which means that the probability of pregnancy was reduced by 22 percent with each increase in the level of cadmium. Males' blood lead exposure also was associated with a ratio below 1 (0.85) with increasing levels, or about a 15 percent reduction in the probability of pregnancy for each increase in the level of blood lead concentrations.

The researchers also calculated a fecundability odds ratio based on both partners' combined lead, cadmium and mercury concentrations. The researchers found a ratio of 0.82 for male lead exposure, representing approximately a 28 percent reduction in the probability of pregnancy for each menstrual cycle, with increasing male blood lead concentration.

"The findings highlight the importance of assessing couples' exposure jointly, in a single, combined measure," Dr. Buck Louis said. "Males matter, because couples' chances of becoming pregnant each cycle were reduced with increasing blood lead concentrations in men."

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