

Small amounts of lead may damage children's kidneys

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Small amounts of lead in the bodies of healthy children and teens — amounts well below the levels defined as "concerning" by the U.S. Centers for Disease Control and Prevention (CDC) — may worsen kidney function, according to a Johns Hopkins Children's Center study published in the Jan. 11 issue of *Archives of Internal Medicine*.

In 1991, the CDC reduced the lead level "of concern" for children from 30 micrograms to 10 micrograms per deciliter of blood, but the Johns Hopkins findings suggest that even levels below 10 present a health risk, providing the first evidence that lead levels that low may impair [kidney function](#).

"To our knowledge, this is the first study to show that very low levels of lead may impact kidney function in healthy children, which underscores the need to minimize sources of lead exposure," says lead investigator Jeffrey Fadrowski, M.D. M.H.S., a pediatric nephrologist at Hopkins Children's.

The Johns Hopkins team cautions that their findings present only a snapshot of kidney status and lead levels, and do not offer definitive proof of cause and effect between the two. But the scientists say their findings are worrisome and emphasize the urgent need for studies that track lead levels and kidney function over time to better understand the interplay between the two.

"Our findings were particularly striking because we saw slightly

decreased kidney function in healthy children without conditions that could account for it, and this could spell more kidney trouble down the road as these children get older or if they acquire additional risk factors for kidney disease, such as high blood pressure and diabetes," says Susan Furth, M.D. Ph.D., senior investigator on the study and a pediatric nephrologist at Hopkins Children's.

Of the 769 healthy children and teens in the study, ages 12 to 20, more than 99 percent had lead levels below 10, with an average level of 1.5 micrograms per deciliter. Those with lead levels in the upper quarter of the normal range appeared to have worse kidney function than children with lower lead levels. Kidney function is defined by the speed with which the kidneys filter the blood. Those with lead levels above 2.9 had a kidney filtration rate 6.6 units (milliliters of blood filtered per minute and adjusted for body size) lower than children whose lead levels were below 1 microgram per deciliter. Researchers also found that for each twofold increase in the amount of lead in the blood, the kidney's filtration capacity dropped by 2.3 units in males and by 3.3 in females. The link between higher lead levels and worse kidney function persisted even after investigators eliminated [high blood pressure](#) — less than 5 percent of those in the study had it — as a possible factor affecting kidney status.

In the current study, the investigators measured kidney function by estimating the kidneys' filtering capacity, called glomerular filtration rate (GFR), using two tests: a standard creatinine test, which measures the speed with which the kidneys filter out creatinine from the blood, and a newer test that measures how fast the kidneys filter out the protein cystatin C. Cystatin C is believed to be a more accurate gauge because, unlike creatinine, which can fluctuate depending on muscle mass and other factors, its levels are more stable. Indeed, the differences in kidney function were far more pronounced when the researchers looked at cystatin C and not as significant when they applied the standard

creatinine test. The investigators say this could mean that past studies that have used creatinine tests may have underestimated the true effect of lead on kidney function.

Lead exposure is a well-established risk factor for neurological damage and developmental delays in children, while chronic exposure to high lead levels is a well-known cause of chronic kidney disease in adults. Despite the elimination of lead from gasoline and paint, most Americans still have detectable lead levels in the blood. The mean blood lead levels in the 12-to-19-year-olds were 1.5 micrograms per deciliter in 1991 to 1994 and 1.1 micrograms per deciliter from 1999 to 2000, researchers say.

Current exposure sources include lead paint, folk remedies, glazed pottery, soil and drinking water in some urban areas with older housing.

Chronic [kidney disease](#) affects 26 million people in the United States.

Provided by Johns Hopkins Medical Institutions

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