

Low lead levels in children can affect cardiovascular responses to stress

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Even low levels of lead found in the blood during early childhood can adversely affect how the child's cardiovascular system responds to stress and could possibly lead to hypertension later in life, according to a study from the State University of New York (SUNY) at Oswego.

Lead exposure was associated with an increase in vascular resistance when the children worked on a stressful computer task. Vascular resistance is a measure of tension within the blood vessels. Increased vascular resistance may lead to hypertension if it continues over time.

The study also found that lead exposure was associated with a decrease in circulating aldosterone levels. Aldosterone is a hormone that helps regulate blood pressure.

The study, Lead exposure and cardiovascular dysregulation in children, was conducted by James A. MacKenzie, Brooks B. Gump, Kristen Roosa, Kestas Bendinskas and Amy Dumas of the State University of New York, Oswego; Robert Morgan of Oswego Family Physicians; and Patrick Parsons of the New York State Department of Health. The researchers will present their findings, which during the 122nd annual meeting of The American Physiological Society (www.the-aps.org/press). The meeting is part of the Experimental Biology 2009 conference, to take place April 18-22 in New Orleans.

Ongoing research

In an earlier study with a different group of children, the researchers found that higher lead levels measured at 2 years of age were associated with an increased vascular response to stress later in life (average of 9.5 years of age). The present study aimed to determine whether this association was true when both lead and vascular responses were measured simultaneously, and if it did, how this happens.

The researchers gave 140 children, 9-11 years old, a psychologically stressful computer task. They measured the children's cardiovascular function, including total peripheral resistance, while they were at rest and while they performed the stressful task. Total peripheral resistance is a measure of arterial pressure relative to cardiac output.

The researchers compared the current blood lead levels of the children to their cardiovascular functioning during the experiment. As with the earlier study, they found that lead levels did correlate to the children's total peripheral resistance response to the stressful task. The finding is important because increases in total peripheral resistance may predispose people to hypertension later in life.

Low lead levels

One of the study's most important findings is that all of the participants had very low lead levels, well below the 10 micrograms per deciliter that the CDC defines as a level of concern. The highest lead level for the children in this study was 3.8 micrograms per deciliter.

Children may be exposed to lead-based paint or lead-contaminated dust in their homes or pick it up from the soil outside. The Centers for Disease Control and Prevention (CDC) has pushed to minimize or eliminate all childhood exposure to lead.

"The interesting thing was that the levels of lead were all pretty low in

the children who participated," Dr. MacKenzie said. "We're seeing the negative effects at these low levels." While these are preliminary findings, the issue deserves more study, he said.

Search for the 'how'

In trying to find an explanation for how lead affects total peripheral resistance, the researchers found increased sympathetic nervous system activity during rest and, paradoxically, a depressed sympathetic response during the stressful computer task. Activation of the sympathetic nervous system produces the "fight or flight" response, raising the heart rate and constricting the blood vessels, among other things. Sympathetic nervous system activity is an appropriate response to stress, but can be harmful if activated for a long time.

"We believe lead causes an increase in sympathetic nervous activity during rest which reduces the body's ability to generate a response when stress comes along," Dr. MacKenzie said. In essence, the cardiovascular system is revving all the time, making it harder for the body to increase in [sympathetic nervous](#) system activity when needed.

The study also found that serum aldosterone levels go down with higher lead levels, making it harder for the body to activate the [sympathetic nervous system](#) when needed. Dr. MacKenzie cautioned that the data on aldosterone and sympathetic activity is still preliminary and may be a focus of future research.

Source: American Physiological Society ([news](#) : [web](#))

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