

Workers exposed to lead show more cognitive problems later in life

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Both the developing brain and the aging brain can suffer from lead exposure. For older people, a buildup of lead from earlier exposure may be enough to result in greater cognitive problems after age 55, according to a follow-up study of adults exposed to lead at work.

A full report appears in the January issue of *Neuropsychology*, which is published by the American Psychological Association.

From the Graduate School of Public Health and the School of Medicine at the University of Pittsburgh, the authors reported that cognitive problems were linked to cumulative exposure.

The researchers followed up on the 1982 Lead Occupational Study, which assessed the cognitive abilities of 288 lead-exposed and 181 non-exposed male workers in eastern Pennsylvania. The lead-exposed workers came from three lead battery plants; the unexposed control workers made truck chassis at a nearby location. At both points in time, all the workers were given the Pittsburgh Occupational Exposures Test battery, which includes measures of five primary cognitive domains: psychomotor speed, spatial function, executive function, general intelligence, and learning and memory.

In 1982, lead-exposed workers were found to have an average blood lead level of 40 micrograms per deciliter (ug/dL), well above normal. Pennsylvania workers found to have 25 ug/dL or more must be taken off the job. In 1982, the unexposed workers had an average blood level of

7.2, within normal limits.

In 2004, the current study followed up with 83 of the original lead-exposed workers and 51 of the original non-exposed workers.

Researchers measured current lead levels in their blood and cumulative lead levels through special X-rays of the tibia, or lower leg bone (bone is the final repository of circulating blood lead, where it has a half life of about 30 years). Researchers also re-administered the test battery to assess cognitive performance relative to both measures of lead.

Among the lead-exposed workers, men with higher cumulative lead had significantly lower cognitive scores. The clearest inverse relationships - when one went up, the other went down - emerged between cumulative lead and spatial ability, learning and memory, and overall cognitive score.

This linkage was more significant in the older lead-exposed men, of at least age 55. Their cognitive scores were significantly different from those of younger lead-exposed men even when the researchers controlled for current blood levels of lead. In other words, even when men no longer worked at the battery plants, their earlier prolonged exposure was enough to matter.

The mild deficits, although not clinically significant, were consistent with other studies that show previous exposure to lead is, according to the authors, "particularly detrimental to the aging brain and that specific cognitive domains may be particularly vulnerable."

Scientists have been investigating how lead damages the brain, especially the hippocampus and frontal cortex, seats of memory and learning. Lead exposure also puts people at greater risk for high blood pressure, which itself weakens cognition -- one possible pathway by which lead can cause problems.

The men who built lead batteries were exposed to it in the air and through their skin. Other occupations, including semiconductor fabrication, ceramics, welding and soldering, and some construction work, also may expose workers. The authors wrote that, "Increased prevention measures in work environments will be necessary to reduce [lead exposure] to zero and decrease risk of cognitive decline."

Article: "Association of Cumulative Lead and Neurocognitive Function in An Occupational Cohort," Naila Khalil, PhD, University of Pittsburgh; Lisa A. Morrow, PhD, and Herbert Needleman, MD, University of Pittsburgh School of Medicine; Evelyn O. Talbott, PhD, John W. Wilson, PhD, and Jane A. Cauley, PhD, University of Pittsburgh; *Neuropsychology*, Vol. 23, No. 1.

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