

Blood Lead Testing

Dr. Joseph E. Graas, Scientific Director
Dr. Edward Moore, Medical Director
Dr. Paul Robandt, Scientific Director

The Center for Disease Control (CDC) has focused on prevention of lead poisoning and monitoring of at-risk populations who tend to have lower incomes, belong to minority groups, be recent immigrants, live in older poorly-maintained buildings or near industrial areas, or have parents exposed to lead at work.¹

The state of California requires blood lead screening for children in publicly-funded programs at 12 and 24 months of age, and children from 24 months to 72 months of age if they were not tested at 24 months or later.² Proposed legislation would require that all children in California are screened for lead exposure³, and this may be preempted by the discovery of lead in the drinking water supplies at several schools in San Diego County.⁴

Environmental lead exposure can cause a number of irreversible toxic effects, interfering with the central nervous system, circulatory system and reproductive system. Intense, high-dose exposure can result in coma, convulsions and death. Chronic low-dose exposure can cause toxic symptoms that are particularly pronounced in children,

in whom it can cause permanent damage to the developing brain, interfering with thought processes and learning behavior.⁵ A recent study has shown that children with elevated blood levels at age 11 became adults with lower cognitive function, decreased IQ points over time and tended to achieve a lower socioeconomic status than their parents.⁶

Prior to industrial exploitation of lead, there was almost no human exposure to the metal. Investigations of skeletal remains indicates that the modern individual typically has 500-1000 times more lead burden than a person who was born in a pre-industrial era. The largest widespread source of lead in the environment is from the prior use of tetraethyl lead in internal combustion engines, from paint pigments, leaded water pipes and from electronic solder. Hot spots of high lead contamination still occur where lead is mined, smelted or recycled. Despite efforts to reduce the widespread sources of lead, older urban areas still have lead contamination and much of the developing world lacks the controls to stop the use of lead in their manufacturing and consumer streams.⁷

Lead can enter the body most easily by inhalation or ingestion of dust containing lead or lead compounds. Shortly after in-

gestion, the lead is distributed in soft tissues and organs, but longer-term storage is in the bones and teeth. For a typical adult, about 94% of the body burden of lead is stored in this manner, but for children it may only be 73%. The storage can be for decades, hence the long-term ramifications of lead exposure in childhood.

Venous blood testing is recommended by the CDC and the State of California to test for current lead exposure, although capillary blood is particularly suited for infants and young children. Blood spotting on paper is an excellent technique to rule out lead exposure, but follow-up on positive results should be made with a venous blood test.⁸ Approved instrumental techniques are anodic stripping voltammetry (ASV), graphite furnace atomic absorption spectroscopy (GFAAS) and inductively-coupled mass spectrometry (ICP-MS). All of these techniques, when performed properly, will deliver a reliable value for lead in blood.

The State of California requires no further action other than normal screening procedures if the blood lead level of the child is < 5 ug/dL. If the result obtained is > 10 ug/dL, there is a series of escalating monitoring, healthcare and social service responses based on the level obtained.⁹

??? Did You Know ???

Recovery support services also include access to evidence-based practices such as supported employment, education, and housing; assertive community treatment; illness management; and peer-operated services. Recovery support services may be provided before, during, or after clinical treatment or may be provided to individuals who are not in treatment but seek support services. These services, provided by professionals and peers, are delivered through a variety of community and faith-based groups, treatment providers, schools, and other specialized services. For example, in the United States there are 22 recovery high schools that help reduce the risk environment for youth with substance use disorders. These schools typically have high retention rates and low relapse rates. Source: SAMHSA

Toxicology Times © 2017 San Diego Reference Laboratory.

Question of the Month

Question: *My patient had a Positive urine drug screen for Cocaine. She is denying use and stating that she went to the dentist and was given Novacaine. Can Novacaine give a positive result for Cocaine?*

Answer: The answer in its simplest form is "no". There is no structural similarity between the compounds Novacaine and Cocaine. Both are used as analgesics and have 'caine' as part of the name, but there is no further connection beyond that. If the testing has been a screen only (immunoassay) a confirmation test is suggested. When performing a confirmation for Cocaine in urine, labs are not looking for Cocaine (the parent drug) but are looking for Benzoyllecgonine, the metabolite of Cocaine use.

Blood Lead Testing

References

- ¹ CDC. CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations in “Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention.” Atlanta, GA:U.S. Centers for Disease Control and Prevention (modified 7 June 2012). <https://www.cdc.gov/nceh/lead/default.htm>
- ² California Code of Regulations, Title 17, Division 1, Chapter 9. Article 2, Standard of Care on Screening for Childhood Lead Poisoning
- ³ AB-1316 Public health: childhood lead poisoning: prevention. CALIFORNIA LEGISLATURE— 2017–2018 REGULAR SESSION
- ⁴ San Diego Unified School District webpage (2017): <https://www.sandiegounified.org/watersampling>
- ⁵ Policy Statement: Lead Exposure in Children: Prevention, Detection, and Management. *Pediatrics*. 2005;116 (4):1036–1046
- ⁶ Aaron Reuben, Avshalom Caspi, Daniel W. Belsky, Jonathan Broadbent, Honalee Harrington, Karen Sugden, Renate M. Houts, Sandhya Ramrakha, Richie Poulton, Terrie E. Moffitt. **Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood.** *JAMA*, 2017; 317 (12): 1244 DOI: [10.1001/jama.2017.1712](https://doi.org/10.1001/jama.2017.1712)
- ⁷ IPEN. Global Lead Paint Elimination by 2020: A Test of the Effectiveness of the Strategic Approach to International Chemicals Management. Berkeley, CA:International POPs Elimination Network (2012).
- ⁸ Yee HY, Holtrop TG. An improved capillary blood filter paper graphite furnace atomic absorption spectrometric method for lead screenings. *J Anal Toxicol* 1997;21:142-148
- ⁹ California Management Guidelines on Childhood Lead Poisoning for Health Care Providers 2008 (https://www.cdph.ca.gov/Programs/CCDCPHP/DEODC/CLPPB/CDPH%20Document%20Library/HAGS_201107.pdf)