

Connecting the Dots for Health - Childhood Lead Exposure

Action

Reduce childhood lead exposure so that blood lead levels are less than 1 µg/dL

Science & Facts

- CDC – “NO safe level of exposure”
- CDC - Action level 5 µg/dL
- Harms Nervous system – decreases IQ
- Lead substitute for calcium
- Children Absorb 50% adults only 10%



Ethics

- Right to lead free environment
- Kids can reach and maintain their full potential

History

- 2000 BC “lead makes the mind give way”
- 1922 – lead paint banned Europe
- 1978 – lead paint banned in US
- 1920’s – lead added to gasoline

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Introduction

Despite the accepted fact that there is no safe level of lead exposure for children there are many children around the world that have elevated blood lead levels. The mean blood lead level (BLL) in the US is about 1.3 $\mu\text{g}/\text{dL}$. Any level above 1.3 $\mu\text{g}/\text{dL}$ can be considered elevated and must results from excessive environmental lead exposure. Human research indicates that the smallest amount of lead exposure results in a degradation of intellectual abilities and lowered IQ.

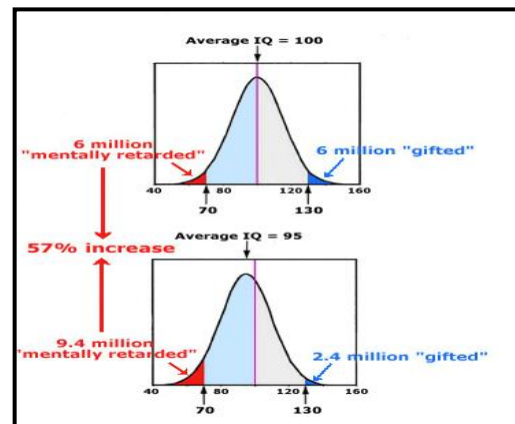
Action

Eliminate childhood lead exposure so that blood lead levels are less than 1 $\mu\text{g}/\text{dL}$

Science

The most recent studies document clearly that BBL as low as 2 $\mu\text{g}/\text{dL}$ causes intellectual impairment and decreased IQ. It is now accepted that there is no safe level of lead exposure and that children are uniquely susceptible harm from lead exposure. Children are not little adults and are vulnerable to low level lead exposure for several reasons. First, children are smaller than adults so that a small exposure results in a big dose by body weight. Second, kids eat more, breath more, and drink more than adults. Third, they exhibit hand to mouth behavior that increase lead exposure.

Forth, lead substitutes for calcium and kids need more calcium to support bone growth. Thus, they absorb approximately 50% of the lead they ingest compared to adults who absorb only 10% of ingested lead. Finally, a child's developing nervous system and other developing organ systems are more susceptible to lead exposure. In addition, fetal lead exposure is multigenerational. A girl exposed to lead during development stores lead in her bones which is the released to the fetus during a subsequent pregnancy. Furthermore, reviews on multiple studies demonstrate that there is greater IQ lose as the blood lead levels increase from 0 to 10 $\mu\text{g}/\text{dL}$ than from 10 to 20 $\mu\text{g}/\text{dL}$. This again demonstrates the sensitivity of the developing nervous system. In conclusion, children are very sensitive the effects of lead and there is no safe level of lead exposure.



History

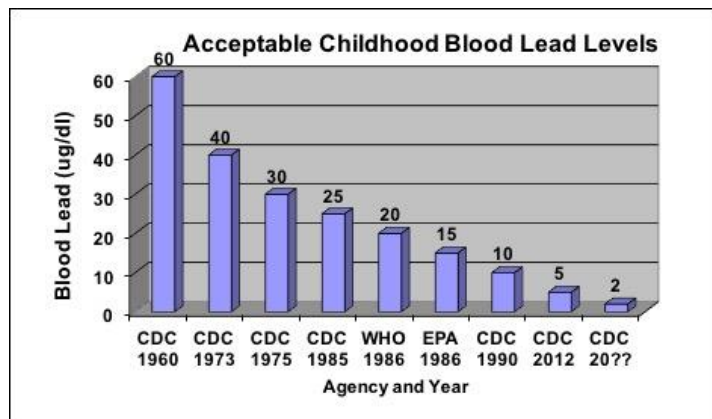
Lead was mined in turkey about 6500 BCE and was wildly used for is low melting point and durability. The Romans widely mined and smelted lead from 500 BCE to 300 CE, which resulted

in a spike in atmospheric lead release that was not eclipsed until the industrial revolution. The human health consequences of lead exposure were recognized over 2000 years ago (“lead makes the mind give way”, second century BCE).

Widespread commercial use of lead soared with the recognition that lead-based paint was both highly protective and durable. In Europe the hazards of lead based were recognized and it was banned by the

league of nations in 1922. In the U.S. lead-based paint was banned in 1978. The addition of

lead to gasoline was disastrous, resulting in the world-wide distribution of lead and dramatically increase children’s blood lead levels. In the US lead was removed from gasoline in about 1990, which resulted in a substantial drop in BLLs. The acceptable BLLs or actionable BLL were gradually lowered as data on the health effects of lead increased and society was able to address elevated BLLs (see figure) documenting the unnecessarily long drift down. In 2012 the actionable BLL was lowered to 5 $\mu\text{g}/\text{dL}$ with provisions to lower it even further. It should also be noted that no safety factor to protect sensitive populations has ever been applied to the acceptable BLL. Yet to be addressed are the regulations on occupational lead exposure and subsequent issues of take home lead exposure.



Ethics

Environmental health ethics and lead exposure is based on a child’s right to an environment free of lead in which they have the best opportunity to reach and maintain their full potential. For many years, the consequences of childhood lead exposure were defined from the standpoint of clinical lead poisoning. Contemporary views of lead toxicity, rather than addressing traditional poisoning, emphasize the sensitivity of the developing nervous system to remarkably low environmental levels of lead exposure. The developmental hazards of lead are no longer disputed. The question confronting us is how to translate this information into health policy to provide public health professionals, as well as the general public, with guidance necessary to protect child development. It is a question that defined intersections of science, public health, and regulatory policy around lead exposure.

Current Regulation

CDC –no safe lead exposure but action level set at 5 $\mu\text{g}/\text{dL}$

OSHA – lead in air – 0.5 mg/m^3 (milligrams per cubic meter)

Worker removal at 60 $\mu\text{g}/\text{dL}$

EPA maximum level for lead in public drinking water systems is 15 $\mu\text{g}/\text{L}$ (15 ppm)

EPA air lead standard 0.15 $\mu\text{g}/\text{m}^3$ rolling 3-month average

The EPA's standard for lead in bare soil in play areas is 400 ppm by weight and 1200 ppm for non-play areas [EPA 2000a]. This regulation applies to cleanup projects using federal funds. <https://www.atsdr.cdc.gov/csem/csem.asp?csem=34&po=8>

OSHA	Blood	40 µg/dL 50 µg/dL and 60 µg/dL	Regulation; cause for written notification and medical exam, and return to work after removal Regulation; cause for medical removal from exposure
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References and Web sites

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