



October 14, 2016

Water Lead Levels: Health Risks in Perspective

The Idaho Department of Health and Welfare (IDHW) is committed to supporting initiatives that identify and control or eliminate all sources of lead in children's environments. IDHW is partnering with the Idaho Department of Environmental Quality, the Idaho Division of Building Safety, and the Idaho Department of Education to assess the lead content in school and daycare water taps and drinking fountains.

If a water source shows lead levels above the Environmental Protection Agency's (EPA) action level of 15 parts per billion (ppb), there are two important questions to answer:

1. What should be done to protect children exposed to this water source?
Answer: Exposure to the lead-contaminated drinking water needs to be stopped until water lead levels are effectively reduced or eliminated.
2. Should potentially exposed children have blood lead testing done immediately?
Answer: Discovery of a water source with elevated lead does not necessarily indicate an immediate need for blood lead testing.

The Centers for Disease Control and Prevention (CDC) currently defines a blood lead level (BLL) above 5 $\mu\text{g}/\text{dL}$ as "elevated", and does not recommend medical treatment for children with BLLs below 45 $\mu\text{g}/\text{dL}$ (CDC, 2016b). IDHW reviewed CDC reports regarding BLLs in people exposed over several years to elevated household water lead levels (WLLs) (CDC, 2004; 2010; 2012a; 2016a). In these well-documented case studies, high WLLs did not have the direct effect on BLLs that we might imagine.

As one example, in Washington D.C. from 2001 to 2004, a change in water treatment disinfection method resulted in very high WLLs. From 2003 to 2004, the D.C. Department of Health and the CDC performed BLL testing on 201 residents in 98 homes with WLLs greater than 300 ppb. The results from that study are shown at the right (CDC, 2004).

TABLE. Blood lead levels (BLLs) of residents in homes with >300 parts per billion in drinking water, by age group — District of Columbia, March 2004

Age group (yrs)	BLL ($\mu\text{g}/\text{dL}$)	
	Median	Range
1–5 (n = 17)	3	1–6
6–15 (n = 13)	2	1–4
16–40 (n = 56)	3	1–14
41–60 (n = 69)	4	1–20
≥ 61 (n = 46)	6	2–22
Total (n = 201)		

Children between the ages of 1-5 are the most sensitive and most likely to have elevated blood lead (CDC, 2015). In the Washington D.C. study, the median BLL for this highest-risk group was 3 µg/dL, and none were above 6 µg/dL.

In this study of long-term exposures to WLLs 20 times higher than EPA's 15 ppb action level, why aren't children BLLs much higher?

To answer this question, it is important to understand that there are several factors at work that strongly affect a child's BLL. Clearly, the actual amount of lead-containing water a child drinks (as opposed to other available beverages such as milk, juice, and soda) is important to consider. Research also shows that other, less obvious factors powerfully affect a child's BLL. For instance, children from certain populations are more likely to suffer elevated BLLs from water lead exposures. These at-risk populations:

- have very low income (more likely to suffer poor nutrition, specifically iron and calcium deficiency which will dramatically increase the chances of suffering harmful health effects from lead),
- use traditional, folk, or ethnic remedies and cosmetics (some lead-containing examples include greta, azarcon, ghasard, ba-baw-san, kohl, and sindoor),
- are recent immigrants (likely to suffer prior lead exposure outside the U.S.),
- live in older, poorly maintained housing (likely containing lead-based paint), or
- have parents who are exposed to lead at work or through hobbies (such as welding, mining, making stained glass and pottery, frequently visiting gun ranges).

Membership in one of these groups does not predict risk in every community, and children in these groups who are not exposed to lead do not have elevated BLLs (CDC, 2016b; Lanphear et al., 2004; Hong et al., 2014; ATSDR, 2007). IDHW encourages parents and caregivers to consider blood lead testing for their child if they belong to one or more of these at-risk populations.

To be clear, this information is not meant to minimize the risks or concerns of elevated WLLs, but rather to offer scientific perspective on the reality of those health risks.

In summary, if elevated WLLs are discovered at a particular school or daycare water source, both the amount of water a child consumes from that source and the known risk factors listed above should be considered when deciding the most appropriate level of response. Though elevated WLLs are a concern that must be effectively controlled or eliminated, elevated WLLs alone will not necessarily result in elevated BLLs.

IDHW supports the CDC position that there is no safe blood lead level (CDC, 2012b) and that all sources of lead in the environments of children should be controlled or eliminated (CDC, 2005). Furthermore, it is IDHW's position that a child's good nutrition is a priority responsibility for parents and school administrators. IDHW encourages parents to seek the consultation of their health care provider when making decisions regarding the health of their children.

For more information on the school and daycare water testing initiative; parents, school administrators, and local health officials are encouraged to visit the Idaho Department of Environmental Quality's informational page on lead and school water testing.

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