
Lead in Soils:

Human and Ecological Health Implications at Badger Army Ammunition Plant

What is Lead?

Lead is a blue gray metal found naturally in the environment. Human activities such as military and industrial operations concentrate lead in some areas, which can lead to a number of significant health risks to both humans and wildlife. Lead is a natural element and does not break down over time, therefore the risks from lead remain until it is removed from the environment.

How Does it Affect Humans and the Environment?

Humans, their livestock, and wildlife can be exposed to lead either by consuming it with food and water or breathing in particles attached to dust and dirt. The toxic effects of lead occur can occur at very low levels, particularly for children. In fact, effects can be seen at the lowest possible levels of detection in blood (ATSDR 2005). Lead targets the central nervous system, and impairs its development in children. Children exposed to lead have demonstrated lower IQs, reduced motor skills, developmental problems, hyperactivity, and increased aggression (Pattee and Pain 2003). One study estimated an average decrease of 1.37 IQ points for every 1 µg/dL in blood (or 0.000001 grams of lead in every 1/5 of a pint of blood) under 10 µg/dL (Canfield et al. 2003). These conditions can be permanent, lasting well beyond the initial exposure and when blood levels return to normal. Lead has also been known to cause adverse effects on the cardiovascular system, including increased blood pressure and chance of heart attack and stroke.



Lead can also affect wildlife and livestock in similar ways. There is some evidence that lead can pass through the food chain, and be passed on to young animals or humans through milk as well (Gulson et al. 1998). Birds are particularly sensitive to lead, suffering from the above detrimental effects at significantly lower levels (EPA 2005).

Implications for the Cleanup of the Badger Ammunition Plant

The soil in many areas at the Badger Army Ammunition Plant (BAAP) in Baraboo, Wisconsin is contaminated with large amounts of lead and other heavy metals. Current plans to remediate the site have a targeted goal of reducing lead to 250 parts per million (ppm) in those soils. This is the Wisconsin state residential cleanup level and the regulatory standard, but does not adequately protect human health or the environment, particularly considering the minute levels that cause adverse effects in children. Prolonged exposure to soil at the proposed cleanup level could raise lead levels in children's blood to dangerous levels.

Wildlife could also be adversely affected by such high lead levels. The EPA's own guidelines suggest screening levels of 56 and 11 ppm for mammals and birds respectively (USEPA 2005). While these concentrations are not necessarily levels which will definitely harm wildlife, they are concentrations where concern is justified. These values were derived from comprehensive reviews of the literature by the EPA's best scientists. The ecological soil screening levels that EPA derived to protect wildlife from the harmful effects of various metals are based on the same toxicity information used for other standards. The low soil standard for lead proposed by EPA is reflective of the greater sensitivity of birds to lead. The Badger property is home to nearly 600 species of plants, butterflies, mammals, reptiles, amphibians, aquatic species, and birds. Grassland birds, in particular, have been able to thrive at the plant, making it one of the most critical habitat areas in the Midwest for this rapidly declining group.



RECOMMENDATIONS

Because of the number of sensitive species such as bald eagles and other birds that reside in and around BAAP, a 250 ppm cleanup level would not be protective of wildlife. In addition, leaving such significant concentrations of lead in the soil could potentially harm the intellectual development of children.



In order to be protective of both human and ecological health, it is recommended that a cleanup level of 30 ppm be used at Badger Army Ammunition Plant and other lead contaminated sites across the country. A remediation goal for human babies should be as close to zero as possible as there is no safe exposure to lead; 30 ppm is a realistic value that can be accomplished through soil removal or novel bioremediation techniques (Maini et al 2000). As lead is studied more and more, we find that it is more and more toxic. It would be a great injustice if our children were allowed to be exposed this incredibly toxic compound unnecessarily.

About the Author

Dr. Peter L. deFur is president of Environmental Stewardship Concepts, an independent private consultant, serving as a technical advisor to citizen organizations and government agencies. He is an Affiliate Associate Professor in the Center for Environmental Studies at Virginia Commonwealth University where he conducts research on environmental health and ecological risk assessment. Dr. deFur serves on EPA's advisory committee on Endocrine Disruptors and has served on numerous committees for the National Academy of Sciences. This report was prepared on behalf of Citizens for Clean Water Around Badger.

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Citizens for Safe Water Around Badger (CSWAB) is working to mobilize and empower rural communities near Wisconsin's Badger Army Ammunition Plant in support of a sustainable future that will protect and restore the integrity of soil, water, air, and biological diversity.

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