Poison Center & Public Health Collaborations Community of Practice (PCPH CoP)

NEWSLETTER

LETTER FROM THE EDITOR February 2024

Greetings!

The present, and second, PCPHCoP newsletter in the toxic metals series focuses on lead.

Public health has made great achievements in reducing lead exposure in recent history. However, some people still experience high levels of lead in their surrounding environments. Exposure to even small amounts of lead can have severe health effects, particularly in children. Thus, it remains a public health priority today.

Sincerely,
Cailee Hill, MPH
Community of Practice Facilitator
PCPHCoP@cdc.gov

TABLE OF CONTENTS

Lead

Lead (Pb) is a naturally occurring metal distributed throughout the earth's crust. Anthropogenic activities, including combustion of leaded gasoline, mining and smelting, and manufacturing lead-containing products, have all added to environmental levels.[1] Lead emitted into the air can travel long distances before settling on land and soil.[1] Despite progress in reducing lead exposures in the United States, it remains a significant public health concern, particularly for children.[2]

Forms of Lead
Elemental: bluish-gray solid material
Organic: lead compounds with carbon
Inorganic: lead compounds without carbon

Organic and inorganic lead compounds are usually in powder, crystal, or liquid form and vary in color.[3] Inorganic lead compounds comprise most of the lead in the environment and are the main source of human exposures today. It can be found in soil, dust, paint, and various consumer products.[1] Exposure to organic lead is usually limited to industrial and occupational contexts.[1]

Historical and present-day uses

Credit: Getty Images

- **Paint**: Historically, inorganic lead was used as a pigment in paint. Lead-based paint (LBP) was widely used in residential homes before the U.S. government banned the manufacture and use of LBP with the Lead-Based Paint Poisoning Act of 1978.[4] Homes built before 1978 are likely to have some LBP still.
- **Gasoline additive**: The organic lead compounds, tetraethyl and tetramethyl, were additives of automobile gasoline. In January 1996, the Clean Air Act banned their use for automobiles. However, soils near busy roadways may still be contaminated from past use.[1] Aviation gas, which is leaded, is still used by certain aircraft today.[5]
- **Pesticides:** Pesticides that contained lead and were widely used on farms and orchards were banned in 1988.[1]
- **Consumer products**: Historically, lead was used in a variety of consumer products, including dishware, silverware, jewelry, and furniture.[4] In 1978, the U.S. Consumer Product Safety Commission banned furniture, toys, and other products with a surface lead content of 0.06% or higher by weight for use by children.[4] This percent was reduced to 0.009% in 2009.[6] Lead can still be used in plastics to soften and make them more flexible.[4] Lead is also used to produce batteries, ammunition, metal alloys and products, and x-ray shielding devices.[1]
- **Plumbing systems:** In 1986, the Safe Drinking Water Act was amended to require the use of lead-free solder, flux, fittings, and pipes when installing and repairing any public water system or plumbing that provides drinking water in buildings after June 1988.[7] Non-potable water outlets such as water for industrial use, firefighting, and irrigation were exempted, along with specific products including toilets, urinals, and shower valves.[8] Before this, it was common for water services lines to be made from lead pipes.

Approximately **29 million homes** have LBP hazards including deteriorated paint and lead-contaminated house dust.[4]

Main sources of human exposure

For adults, exposure to levels of lead beyond background is usually associated with occupational exposures.[1] In children, exposure to high lead levels is associated with contaminated paint, soil, and water.[1] Lead is particularly accessible to children because of their hand-to-mouth behavior and close breathing proximity to surface dust.[1]

Drinking Water	Lead in drinking water is regulated under the Clean Water Act and the Safe Drinking Water Act, which includes the Lead and Copper Rule.[7] However, it is estimated that there are still 6 to 10 million lead service lines delivering water in the country.[7] You can't see, taste, or smell lead in drinking water.[4] A person's risk of lead exposure from drinking water depends on their underlying health, length of exposure, and chemical water conditions.[4]	Lead enters drinking water when corrosion occurs in plumbing material that contains lead. The amount of lead that enters the water is related to • the acidity or alkalinity of the water, • the type and amount of minerals in the water, • the amount of lead that the water has contact with, • the water temperature, • the amount of wear in the pipes, • how long the water stays in pipes, and • the presence of protective coatings in the pipes.[4]
Paint	The peeling, chipping, chalking, and cracking of LBP from weathered surfaces, particularly in older homes and buildings, continues to be a source of childhood lead poisoning.[7] Deteriorating painted surfaces, such as windows, doors, and cabinets, can cause lead chips and dust. Children can be exposed if they ingest lead chips or breathe in lead dust.[4]	
Soil	Spending time in areas with contaminated soil can result in lead exposure.[4] Areas include airports, factories, or structures with exterior LBP. Contaminated soil particles can be brought inside on shoes, clothing, or pets.[4] While playing in lead-contaminated soil, children can be exposed by swallowing soil or breathing in lead dust from the soil.[4] Children with pica, an eating disorder characterized by compulsive eating of non-food items, may be particularly at risk of exposure from eating lead-contaminated soil.[4]	

Consumer Products

Antique and vintage products: Lead can be found in antique and vintage products because these items were often made before lead regulations were put in place.[4]

Imported products: Imported products such as toys, jewelry, candy, and traditional cosmetics and medicines may contain lead since it is still widely used in other countries.[4] Check out Lead in Consumer Products and Lead in Foods, Cosmetics, and Medicines for more information.

Lead-containing plastic products: When exposed to sunlight, air, or detergents, lead and plastic bonds can break down, forming lead dust.[4]

Credit: Getty Images

Hobbies

There are many hobbies which may involve exposure to lead hazards. These hobbies include

- Casting or soldering bullets, fishing weights, and stained glass
- Shooting firearms
- Mixing or applying lead-containing pottery glazes
- Drinking home-distilled liquids such as moonshine[28]

Occupational

Occupations with the highest risk for lead exposure are those within the construction, manufacturing, mining, and service (e.g., remediation and automotive repair) industries. In 2021, storage battery manufacturing industries had the most cases of lead exposure.[9]

You could swallow lead dust if you eat, drink, or smoke in areas where lead is processed or stored.[9] Lead dust may be brought home on work clothes and personal items, exposing one's family unknowingly.

Jobs that may involve lead exposure include

- Cleanup of contaminated sites
- Demolition or renovation of buildings
- Manufacturing of lead-containing products
- Industrial and small-scale metal processing
- Use of firearms or working at a firing range
- Painting industrial equipment or structures
- Recycling lead-containing materials
- Replacing lead water service lines[2,9,10]

Health Effects

Lead exposure can affect almost every organ and system in the body, but the nervous system is the main target. Though the amount absorbed into the body differs if inhaled or ingested, the effects are the same.[1] After a few weeks, most of the lead absorbed into the blood moves into the bones and teeth, where it is stored and can accumulate over time.[1] Lead exposure can cause adverse health effects in all ages but is especially dangerous for children under the age of six years.[4]

Studies show that in adults, about 3-10% of lead ingested is absorbed into the blood from the stomach. In children, those numbers rise to about 40-50%.

When lead fumes are inhaled, almost all the lead is absorbed into the blood in both adults and children.[1]

Adults: Adults exposed to lead can suffer from cardiovascular effects, increased blood pressure, nerve disorders, decreased kidney function, and fertility problems.[2,7] Long-term exposure can also result in decreased learning, memory, and attention; weakness in fingers, wrists, or ankles; and anemia.[1] Exposure to high levels can severely damage the brain and kidneys and cause death or a miscarriage if pregnant.[1]

Infants and Children: No safe blood lead level in children has been identified. Lead exposure harms children under six years old more because their bodies are developing rapidly. Lead poisoning in children can be challenging to see because most have no immediate or noticeable symptoms, but even low-level exposure can negatively affect their development and behavior.[4] During pregnancy, lead stored in the bones and teeth of the pregnant woman is released into the blood and can expose the fetus or breastfeeding infant.[7]

In 2021, the CDC updated the blood lead reference value from 5.0 µg/dL to 3.5 µg/dL. This helps to identify children with levels that are higher than most.[4]

Lead exposure in children can cause brain and nervous system damage, slowed growth and development, learning and behavior problems, and hearing and speech problems.[4] Exposure to high levels can cause seizures, coma, and death.[7]

Additional Resources

Lead | Toxicological Profile | ATSDR

Poison Emergency?

Call 1-800-222-1222 OR
Visit POISONHELP.ORG

Announcements

The next quarterly PCPHCoP webinar will be held **April 17, 2024, from 3:00 p.m. to 4:00 p.m. Eastern Time.**

To be added to the CoP email distribution list, please request by emailing PCPHCoP@cdc.gov.

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