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TECHNICAL BULLETIN

HEALTH EFFECTS INFORMATION

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Environmental Toxicology Section
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SYNONYMS

Pb (chemical symbol), plumbum, olov, pigment metal

USES

Lead in its pure state (elemental lead) is a dull gray, heavy metal which is soft and very flexible. In its many combined forms, lead compounds may be powders of various colors, pigments in paints, and lubricating greases. In addition, lead is a component in many metal alloys and is present in many finishing materials, including ceramic glazes. Because of its moldability, resistance to tarnish and rusting, and density, metallic lead has been used to make toys and a variety of metal parts for machinery. Lead is also a popular material for fishing weights, firearm ammunition, and for a variety of ballast and balancing weights. Lead has been a major component of automotive batteries and an antiknock ingredient in gasoline and other fuels due to its unique chemical behavior. Historically lead has been an ingredient in many household products including pesticides, plumbing fixtures, interior and exterior paints, and in a variety of food utensils. In 1986, prior to its ban from most automotive gasoline products, 70% of the lead used in the US was for transportation industry uses.

Recent years have seen a trend of removal of lead constituents in fuels, paints, toys, food industry uses and household products; but lead continues to be present in most household environments and throughout many industrial settings.

CHEMICAL AND PHYSICAL PROPERTIES

Metallic lead is a soft, very heavy, dull-gray material that is relatively stable under normal atmospheric conditions. Unless it is present in its elemental (metallic) form, lead does not have recognizable identifying features such as color, odor or taste, that would warn of its presence. It is relatively stable and insoluble under normal conditions, but small quantities dissolve and erode into its surrounding environment. These small contributions may be harmful under certain circumstances. Lead salts, lead alloys, and other combined forms of lead have extremely variable characteristics. Some are extremely soluble or, for other reasons, readily release harmful forms and quantities of lead into their environments. Various coloring, lubricating, anticorrosion

and other chemical or physical properties have made lead an extremely useful and versatile substance; and consequently it is commonly found in the environment.

OCCURRENCE AND SOURCES OF LEAD

Lead is a naturally occurring element that is found in the earth as a trace constituent in soil, rocks and minerals. It is extracted by mining and then converted to a myriad of forms and products. Releases to the environment occur by air and water discharges from industries which use lead products, as a component of smoke when lead-containing products are burned or exposed to very high temperatures, as a component of exhaust from lead additives in fuels, and into soil and water when materials containing lead are buried or dumped. Lead is extremely stable in the environment.

Lead is seldom found in natural waters, but it frequently enters drinking water supplies by dissolving from piping, fittings, joining materials, and fixtures in water supply systems. Usually the only source of lead in a drinking water system is household plumbing. In its dissolved state (ionic form) lead is invisible, odorless and without taste in water.

ENVIRONMENTAL FATE

Lead that is released into the environment as fine particles or as vapor in the air will settle to the earth relatively quickly as a solid. It does not remain suspended in air indefinitely nor does it usually travel long distances in air. Lead in air is hazardous to humans and animals if it is inhaled or if it settles on food or other materials that are ingested.

Lead that is released into surface water or that is leached from the surface of the earth by rainfall may dissolve in the water, and remain indefinitely or it may remain in particle form and only move short distances before settling or being filtered out of the water. Most of the lead released to water becomes tightly associated with bottom sediments, and lead that is released to the surface of soils usually stays very near the surface in particle form. Dissolved or suspended in water, lead is hazardous to animals and humans if it is ingested in sufficient quantities.

Some forms of lead are chemically unstable and will oxidize or react in other ways

with the environment so they may change their form and behaviors. Lead does not degrade or disappear. It only changes forms and locations on the earth. The challenge is to minimize the amounts of lead in the water we drink, the foods we eat, and the air we breathe.

DRINKING WATER STANDARDS

The US Environmental Protection Agency has adopted an action level for lead in public water systems. This national "action level" is 0.015 milligrams of lead per liter of water (ppm). This is a very protective standard and is aimed at protecting pregnant women and small children, the most susceptible people in our population. Public water systems found to have levels of lead above this standard are required to install corrosion control treatment to reduce the aggressiveness of the water, preventing or reducing the leaching of lead into the water. Habitual consumption of drinking water having more than 0.015 mg of lead per liter of water (ppm) is believed to contribute to impaired brain and nerve development and decreased learning ability in young children. Nonpregnant, healthy adults are thought to be much more tolerant to low level lead exposures than very small children and developing fetuses.

REMOVING LEAD FROM DRINKING WATER

In Oregon, the challenge is principally how to prevent lead from entering our drinking water. Lead may become incorporated into drinking water in the course of treatment, storage and delivery of water to the customer. An even greater potential for lead exposure is found in the internal plumbing of many buildings, including residential structures. Generally when unacceptable levels of lead are found in residential water, it is from building plumbing.

Public water suppliers are required to periodically test the household water of a certain percentage of homes. If excessive lead levels are found in these homes, but not in the water being delivered to those homes, the supplier will be required to treat the water to reduce its tendency to dissolve materials. In some cases it is necessary to replace all or part of a plumbing system or certain components in the plumbing system. These measures are the best long-term solution to household plumbing lead.

Obviously, these changes cannot be completed immediately, so you may need to take

the following precautions to protect yourself until you are assured that your water consistently contains less than 0.015 mg/liter of lead.

REDUCING EXPOSURE TO LEAD IN DRINKING WATER

Contact your water supplier about the results of testing your water, if your house has been tested. If your home has not been included in the testing program, you may wish to hire a private laboratory to test it for you. Be sure you test "first-draw water." "First-draw" means the first water to come from a faucet after a period of 6-8 hours without any use; for example, the first use in the morning or after a day of absence.

If your first-draw water contains **0.015** milligrams of lead per liter **or greater** amounts, it is important for you to also test your water after the plumbing has been thoroughly flushed by running the water for several minutes. If the "flushed water" sample contains **less than 0.015** mg of lead per liter of water; you can avoid exposure as follows: 1) Each morning run your cold water taps for several minutes to flush all of the water that has been standing overnight (this water can be used for laundry, bathing and cleaning purposes.) 2) Never use water from hot water taps for food preparation, drinking water or for preparing beverages or for beverage ice, 3) Always run the cold water for a minute or two before drinking or before using the water in a food or beverage product (even one hour of standing in your plumbing can result in unacceptable levels of dissolved lead in your water), 4) Use the same precautions in preparing bottles, formula or other baby foods or beverages.

If your first-draw water contains **more than 0.015** mg of lead per liter and your flushed water sampling fails to produce a reduction to **0.015** mg per liter **or less**, you should discontinue all uses of this water for food preparation, beverage ice, for drinking or for beverage preparation. Use water from an alternative source known to be safe, until you have found and eliminated the source of lead in your drinking water.

There are treatment processes that will remove lead from drinking water. For information or advice about water treatment, you are encouraged to contact the Drinking Water Section of the Health Division at (503) 731-4317.

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