

F. Lead

CAS Number 7439-92-1

1. Overview

Lead is a soft metal that is found naturally in the earth's crust. Before 1978, lead was frequently used in paints. Lead paint can still be found in many older residential structures. Other examples of uses of lead are in gasoline (formerly), piping, solder, coatings, glazes, leaded crystal, jewelry and toys.

Lead, a neurotoxin, is a danger for young children when it is ingested. Lead in household dust, paint chips, toys or jewelry may be ingested by young children when they chew, mouth, or swallow items or crawl on the floor and mouth their hands.

There are standards in the U.S. for the amount of lead that can be used in children's toys, but in some cases products are not in compliance and children are exposed to lead. An example of this occurred in 2006 when a young boy in Minnesota died from acute lead poisoning after ingesting a charm that did not comply with lead standards. In 2010, the Consumer Product Safety Commission (CPSC), which is responsible for monitoring compliance with federal consumer safety product standards, made 24 recalls of infant and children's products that contained more than permitted levels of lead. Often the recalls involved imported items, though some products were manufactured in the U.S. (Consumer Product Safety Commission [CPSC], 2010b).

Because of its toxicity, pervasiveness, and continued effect on children despite regulatory action, lead is being named a Minnesota Priority Chemical.

Further information about exposure, toxicity, and regulation are described below.

2. Exposure and Environmental Disposition

(Note: This section includes examples of exposure and environmental information. This summary is not intended to be comprehensive.)

a. Centers for Disease Control and Prevention

(1) Agency for Toxic Substances and Disease Registry (ATSDR)

People can be exposed to lead from contaminated soil, dust, drinking water that has been transported in lead pipes, and lead paint chips. Jewelry can also contain lead that can be transferred to the skin, but the skin does not absorb lead readily (Agency for Toxic Substances and Disease Registry [ATSDR], 2007). Other potential sources of exposure, particularly for infants and children, are breast milk, toys, hair dyes, cosmetics and some home remedies.

(2) National Health and Nutrition Examination Survey (NHANES)

Sources of exposure to lead can include lead paint chips, water transported in lead pipes, ceramics coated with lead-based glaze, stained glass window framing, toys and trinkets,



lead on the clothing of workers in certain occupations, lead-containing cosmetics and home remedies (Centers for Disease Control and Prevention [CDC], 2010a).

For adults, NHANES reports that blood lead levels (BLLs) have been declining over the past decade, with the U.S. adult BLLs similar or slightly lower than in other developed countries. In the 2005-2006 data, the geometric mean of the adult BLL was 1.41 µg/dL (CDC, 2010b).

For children, lead levels have also been decreasing over time. In the 2005-2006 data, the geometric mean for children age less than 5, the geometric mean was 1.46 µg/dL (CDC, 2010b) However, children with certain risk factors, such as non-white minority race, urban residence, or low family income tend to have higher BLLs (CDC, 2010a).

b. Consumer Product Safety Commission (CPSC)

In 2010, there were 24 recalls of children's or infant products listed on the CPSC website. Some of the recalled items were children's jewelry (CPSC, 2010b). Most, but not all, of these recalls involved materials produced outside of the U.S. At least one of the recalled products involved the need to treat a child for high lead levels (CPSC, 2010c).

c. Environmental Protection Agency (EPA)

(1) Inventory Update Reporting (IUR)

Lead was produced or imported into the U.S. at quantities of 1 billion pounds or more in the 2006 EPA Inventory Update Reporting (IUR) data (Environmental Protection Agency [EPA], 2010a). No use information was available for inorganic chemicals in this inventory, but usage information for inorganic chemicals will be required in the 2011 inventory.

(2) Toxic Release Inventory (TRI)

In 2009, there were about 14.3 million pounds of lead reportedly released to the environment in the U.S. (EPA, 2010d). In Minnesota in 2009, there were 12,973 pounds of lead released from 109 sites throughout the state (EPA, 2010c). The primary release method was disposal to off-site storage for an indefinite time and to landfills. This is an increase from the amounts reported released annually in Minnesota from 2002 - 2008, but a decrease from the peak in 1998, when 293,303 pounds of lead were released (EPA, 2010e).

d. Minnesota Department of Health (MDH)

In 2009, there were 778 children with high BLLs reported in Minnesota (Minnesota Department of Health [MDH], 2010a). While the BLLs in children have been decreasing, the goal is to eliminate this preventable condition. Lead poisoning in children often is related to ingestion of paint chips in older homes, though exposure to toys and other products containing lead can also result in lead exposure.

e. National Institutes of Health

(1) Hazardous Substances Data Bank (HSDB)

Lead has been found in wildlife (Hazardous Substances Data Bank [HSDB], 2010) and may appear in food.

Maternal milk might be a source of lead for offspring, particularly when the mother has elevated BLLs (HSDB, 2010).

(2) Household Products Database

In the Household Products Database, there are currently eight products containing lead. Six of these products are solder, one is ceramic glaze, and one is a colorant for landscaping concrete. The lead content listed for these items ranges from 0 to 100%, with some at 30-60% (National Library of Medicine [NLM], 2010). Because the Household Product Database provides information found in material safety data sheets (MSDS), if an MSDS is not required for the product, it is unlikely the product will appear in this database.

3. Toxicity

(Note: This section provides examples of toxicity information from several sources. This summary is not intended to be comprehensive.)

a. Centers for Disease Control and Prevention

(1) Agency for Toxic Substances and Disease Registry (ATSDR)

Lead targets the nervous system in humans. It can result in weakness, increased blood pressure, anemia, and brain and kidney damage. High exposure levels can result in miscarriage or affect sperm production. Exposures to lead can affect development and behavior in children (ATSDR, 2007).

(2) National Health and Nutrition Exposure Survey (NHANES)

Lead can interfere with actions of nutrients, enzymes, regulatory proteins, and other physiological mechanisms in the body, as well as gene expression. Lead poisoning can result in anemia, kidney damage, seizures, abdominal pain, and neurocognitive effects (CDC, 2010a).

b. Environmental Protection Agency

(1) Integrated Risk Information System (IRIS)

Cancer: B2 (Probable human carcinogen) (EPA, 1990)

(2) Office of Pollution Prevention and Toxics (OPPT)

Lead is known to be toxic to the neurological system, with manifestations of conditions such as lowered intelligence, decreased coordination, behavioral and learning problems, slowed growth, and hearing problems (EPA, 2010b).

c. National Institutes of Health

National Toxicology Program (NTP)

For carcinogenic potential, lead has been classified as: Reasonably anticipated to be a human carcinogen (National Toxicology Program [NTP], 2004).

d. World Health Organization

International Agency for Research on Cancer (IARC)

Lead is classified as a Group 2A carcinogen: Probably carcinogenic to humans (International Agency for Research on Cancer [IARC], 2006).

4. Statutory Requirements

In relation to Minn. Stat. 2010 116.9401-116.907, lead meets the following criteria:

Statute	Information	References
Minn. Stat. 2010 116.9401		
Subd. (e)(1) harm the normal development of a fetus or child or cause other developmental toxicity	Developmental effects	ATSDR 2007
Subd. (e)(2) cause cancer, genetic damage, or reproductive harm	Reproductive effects Cancer: EPA IRIS: B2 probable human carcinogen Cancer: IARC: Probably carcinogenic to humans (Group 2A). Cancer: NTP: Reasonably anticipated to be a human carcinogen	ATSDR 2007 EPA 1990 IARC 2006 NTP 2004
Subd. (e)(3) disrupt the endocrine or hormone system	Disruption at high blood lead levels	ATSDR 2007
Subd. (e)(4) damage the nervous system, immune system, or organs, or cause other systemic toxicity	Neurotoxicity Kidney damage	ATSDR 2007 ATSDR 2007 CDC 2010a
Subd. (e)(5) be persistent, bioaccumulative, and toxic;	(The EPA has designated lead as a PBT for the Toxic Release Inventory program.)	EPA 2001
Subd. (e)(6) be very persistent and very bioaccumulative		
Minn. Stat. 2010 116.9403		
Subd. (a) (1): has been identified as a high-production volume chemical by the United States Environmental Protection Agency	1 billion pounds or greater	EPA 2010a
Subd (2) Meets any of the following criteria:		
Subd. (a)(2)(i): the chemical has been found through biomonitoring to be present in human blood, including umbilical cord blood, breast milk, urine, or other bodily tissues or fluids	Blood, tissue, breast milk	ATSDR 2007 CDC 2010a HSDB 2010

Subd. (a)(2)(ii): the chemical has been found through sampling and analysis to be present in household dust, indoor air, drinking water, or elsewhere in the home environment	Household dust, indoor air, drinking water	ATSDR 2007 CDC 2010a EPA 2010b
Subd. (a)(2)(iii): the chemical has been found through monitoring to be present in fish, wildlife, or the natural environment	Fish, wildlife (also a naturally occurring element)	HSDB 2010

5. Current Regulations

a. Federal

(1) Consumer Product Safety Commission (CPSC)

Standards related to lead in children’s toys have been in place for many years. In 2008, the Consumer Product Safety Improvement Act (CPSIA) lowered the limits allowable in children’s toys. During a phase-in period, the allowable levels of total lead by weight for any part of a children’s toy dropped from 600 ppm in February 2009 to 300 ppm in August 2009. In August 2011, the limit is scheduled to drop to 100 ppm. However, the CPSC is yet determining if the 100 ppm level is feasible. After August 2009, a limit of 90 ppm on the surface coatings on consumer products went into effect (CPSC, 2010a). There have been several recent recalls related to children’s products for unacceptably high lead content.

(2) Environmental Protection Agency

In 2010, EPA enacted a rule intended to minimize potential hazards related to lead during renovation. This rule has requirements for contractors performing renovation to ensure that homeowners and tenants are informed about lead in the home. Contractors are also required to complete certification concerning knowledge of safe lead practices (MDH, 2010b). For more information, please see <http://www.health.state.mn.us/divs/eh/lead/prof/pre/index.html> or <http://www.epa.gov/lead/pubs/lscp-press-materials.htm>.

b. States

Several states have enacted regulations to reduce lead use and/or exposure. Many states have laws prohibiting certain metals from packaging and restricting lead components in automobiles and recreational equipment. Because most of these products are excluded from the requirements of Minn. Stat. 2010 116.9401-116.9407, these items are not included here.

Aside from packaging, automobile and recreational equipment-related legislation, the following information, taken from The Lowell Center for Sustainable Production, US State Chemicals Policy database at <http://www.chemicalspolicy.org/chemicalspolicy.us.state.database.php>, describes state-level legislation related to lead for uses that could pertain to children.

Minnesota

Year: 2007

Minn. Stat. 325E.389 (2008)

Restricts the sale or manufacturing of any jewelry that is offered for sale in Minnesota unless the jewelry is made entirely from a Class 1, Class 2, or Class 3 material. Prohibits the sale of any jewelry as children's jewelry or body piercing jewelry represented to contain safe levels of lead, unless the jewelry meets certain requirements. (Became effective August 30 and 31, 2009)

California

Year: 2010 (Amendment)

Cal. Health & Safety Code §§ 108550-108585

Prohibits the manufacture or sale of any toy contaminated with any toxic substance, coated with paints and lacquers containing compounds of lead, or coated with soluble compounds of antimony, arsenic, cadmium, mercury, selenium or barium.

Year: 2006

Cal. Health & Safety Code §§ 25214.1-25214.4.2

Prohibits a person, on and after March 1, 2008, from manufacturing, shipping, selling, or offering for sale jewelry, body piercing jewelry and children's jewelry for retail sale in the state, unless it contains less than 200 or 600 parts per million of lead by weight (standard varies by material). Includes civil and criminal penalties for a person who violates the prohibitions. Specifies the testing methods and protocols for determining compliance with the prohibitions.

Year: 1997

Cal. Health & Safety Code §§116875-116880

Concerns prohibitions on the use of lead in water pipes

Prohibits the use of any pipe, pipe or plumbing fitting or fixture, solder, or flux that is not lead free (not more than 0.2% lead with respect to solder and flux and not more than 8% lead with respect to pipes and pipe fittings) in the installation or repair of any public water system or any plumbing in a facility providing water for human consumption.

Prohibits the introduction into commerce of any pipe, pipe or plumbing fitting, or fixture that is not lead free. Prohibits people engaged in the business of selling plumbing supplies, except manufacturers, from selling solder or flux that is not lead free. Requires labeling of solder and flux that is not lead free.

Connecticut

Year: 2008

H.B. 5650, 2008 Gen. Assemb., Feb. Sess

Requires the Commissioners of Public Health and Environmental Protection to compile a list of toxic substances and the recommended maximum amount of such toxic substances that may exist in children's products. Requires the Commissioner of Consumer Protection to compile a list of safer alternatives to using said toxic substances. Requires certain consumer products determined by the Commissioner of Consumer Protection that bear lead-containing paint or that have lead in any part of the product and that a child may

reasonably or foreseeably come into contact with, to carry a warning label. Permits the Commissioner of Consumer Protection to adopt a stricter standard than one hundred parts per million total lead content by weight for any part of a children's product if the Administrator determines that a stricter standard is feasible. Permits the Commissioner of Environmental Protection to participate in an interstate clearinghouse to (1) prioritize chemicals existing in commercial goods; (2) organize and manage available data on chemicals; (3) produce and inventory information on safer alternatives for specific uses of chemicals and model policies and programs related to such alternatives; and (4) provide technical assistance to businesses and consumers relating to safer chemicals.

Delaware

Year: 2008

H.B. 362, 144th Gen. Assemb., Reg. Sess. (Del. 2008).

Prohibits the sale of a toy that contains a toxic substance (defined as lead or a coating on an item that contains lead or a substance that has been deemed toxic or harmful to the health of children by the U.S. Consumer Product Safety Commission).

Illinois

Year: 2007 (Amendment)

410 Ill. Comp. Stat. Ann. 45/1-45/17 (2008).

Amends existing legislation to strengthen protection from lead poisoning in children. Prohibits the addition of lead to surfaces children occupy, or which children could put in their mouths, including toys, jewelry, furniture.

Louisiana

Year: 1998 (Amendment)

La. Rev. Stat. Ann. §§ 40:1299.26 (2008)

Prohibits the sale or application of lead-based paint or similar surface coating material on toys or articles intended for use by children, residential furniture and fixtures that can be readily chewed by children, and cooking, eating, and drinking utensils. Prohibits the sale of any toy or other article intended for use by children, residential furniture, cooking, drinking or eating utensils to which any lead-based paint or similar surface coating material has been applied

Maine

Year: 2008

Me. Rev. Stat. Ann. tit. 22, § 1316-A (2008)

Restricts the sale, manufacture or distribution of lead-containing children's products.

Year: 2006

Exec. Order Promoting Safer Chemicals in Consumer Products and Services (February 22, 2006)

Requires the Department of Environmental Protection to incorporate readily available information on source reduction and safer alternatives to hazardous chemicals in consumer products into their public education efforts. Requires the Department to continue to virtually eliminate mercury from human caused sources, assess lead-free

alternatives to the current use of lead in consumer products, and review emerging information related to the availability of alternatives to brominated flame retardants. Requires executive branch agencies to avoid products and services that contain, use, or release chemicals that are PBTs or carcinogens whenever safer alternatives are available, effective, and affordable. Creates the Governor's Task Force to Promote Safer Chemicals. Requires the Task Force to identify and promote the use and development of safer alternatives to hazardous chemicals in consumer goods and services made, provided, or sold in Maine.

Maryland

Year: 2010

H.B. 372, 427th Gen. Assemb., Reg. Sess. (Md. 2010)

Requires the use of lead-free pipes, pipe fittings, plumbing fittings, fixtures, solder, or flux in the installation or repair of plumbing intended to dispense water for human consumption. Prohibits the sale of pipes, pipe fittings, plumbing fittings, or fixtures that will be used in the installation or repair of any plumbing that dispenses water for human consumption unless they are lead-free. Prohibits the sale of solder or flux that is not lead-free unless the solder or flux bears a label stating that it is illegal to use the solder or flux in the installation or repair of any plumbing that dispenses water for human consumption.

Year: 2009

H.B. 119, 426th Gen. Assemb., Reg. Sess. (Md. 2009)

Amends existing legislation prohibiting lead-containing children's products (See H.B. 62). Clarifies the manufacturers and importers that are required to perform certain testing and the children's products to be tested to determine whether they are lead-containing products.

Year: 2008

H.B. 62, 425th Gen. Assemb., Reg. Sess. (Md. 2008)

Prohibits the manufacture, sale, offer for sale, importation, or distribution of specified lead-containing children's products by any means, including through a sales outlet or the Internet.

Massachusetts

Year: 2009

Exec. Order No. 515 (Oct. 27, 2009)

Requires the Executive Department of the Commonwealth of Massachusetts and its agencies to reduce their impact on the environment and enhance public health by procuring environmentally preferable products and services whenever such products and services are readily available, perform to satisfactory standards, and represent best value. Environmentally preferable products include, but are not limited to, products and services that are less toxic and hazardous. Establishes a Toxic Reduction Task Force to provide guidance on and assist agencies with identifying and eliminating purchases of products that contain toxic chemicals. Requires the EPP Program and agencies to, wherever feasible, eliminate products procured by the Commonwealth that contain toxic chemicals in concentrations that pose a significant threat to the environment and/or public health.

Year: 2008 (Amendment)

Mass. Gen. Laws, ch. 111, § 196 (2008)

Prohibits the sale, delivery, or possession with intent to sell, deliver or give away any toy, furniture, cooking, drinking or eating utensil to which any lead-based paint, glaze or other substance has been applied.

Year: 2008 (Amendment)

Mass. Gen. Laws, ch. 94B, §§ 1-10 (2008)

Prohibits any person from selling, delivering, giving away, or introducing into commerce any misbranded hazardous substance or banned hazardous substance. Permits the Commissioner of Public Health to declare any substance or mixture of substances, which meet certain requirements, to be a hazardous substance. Under this authority, the Commissioner has declared formaldehyde, urea-formaldehyde foamed in-place insulation, and children's leaded jewelry to be hazardous substances. The Commissioner has declared urea-formaldehyde foamed in-place insulation and children's leaded jewelry to be banned hazardous substances. Requires urea-formaldehyde foamed in-place insulation and children's leaded jewelry to be removed from commerce. (105 CMR 650)

Michigan

Year: 2007

H.B. 4132, 94th Leg., Reg. Sess. (Mich. 2007)

Prohibits a lead-bearing substance from being used in or on any children's jewelry. Prohibits the sale of children's jewelry containing a lead-bearing substance. Makes information about the hazards of lead-bearing substances and any programs offered to educate individuals about those hazards available via the internet.

Year: 2007

H.B. 4399, 94th Leg., Reg. Sess. (Mich. 2007).

Prohibits the sale of lunch boxes that contain a lead-bearing substance.

Year: 2007

S.B. 174, 94th Leg., Reg. Sess. (Mich. 2007)

Prohibits use or application of a toxic substance (i.e. substance that contains lead, or a coating on an item that contains lead) in or on any toy or child care article. Prohibits the sale, or transfer of a toy or child care article in this state that contains a toxic substance.

Vermont

Year: 2008

2008 Vt. Acts & Resolves 193.

Prohibits the sale of any children's product that contains lead. Prohibits the sale of any jewelry that contains lead. Requires phase out of wheel weights containing lead. Requires labels on all plumbing equipment for sale that contains lead. Prohibits the sale of solder or flux for plumbing that contains lead. Requires a warning on all nonresidential paints and primers containing lead. Requires warning labels on salvaged building materials for sale stating that these products may contain lead.

Washington

2008

2008 Wash. Sess. Laws 288.

Contains limits on lead, cadmium, or phthalates in children's products (preempted by the Federal Consumer Product Safety Improvement Act).

(Lowell Center for Sustainable Production, 2010)

6. Conclusion

Lead continues to pose a threat to children, despite attempts to control it. However, there is evidence that human BLLs are decreasing. Because of its toxicity and pervasiveness, lead is being named a Minnesota Priority Chemical. Information on any changes in federal or state policy, as well new information as health impacts and exposure routes, especially in children, will be monitored.

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