FACT SHEET

March, 2003

Lead (Pb) and Lead Compounds

Lead can damage the brain, nervous and reproductive systems, and kidneys. Children's exposure to low levels of lead can cause learning difficulties, irritability, and other behavioral changes. Lead is still widely used in products, including lead acid batteries and plastics, the wire and cable industries, wire and cable sheathing, sporting equipment, jewelry and solder to make electronic equipment. More than 11 million pounds of lead and lead compounds were used by Massachusetts manufacturing facilities in 2000.

Health Effects

People can be exposed to lead through drinking water contaminated with lead from older piping, ingesting lead-contaminated food, breathing leaded dust particles in the air from chipping and peeling leaded paint in older homes, ingesting leaded soil from gasoline emissions and leaded paint chips, or through occupational or hobby exposures. Children can be exposed to leaded dust from lead-stabilized plastics (e.g., mini-blinds) which can disintegrate over time in the presence of sunlight or heat.

The neurotoxicity of lead and its health impacts have been well-established for decades. Children exposed to lead can suffer kidney damage, colic, anemia, learning difficulties, mental and physical developmental delays (walking, sitting up), and may exhibit behavioral changes, such as increased irritability or aggression. Children exposed to very high levels of lead can suffer convulsions, coma, brain damage and death. Fetuses can be exposed to lead if the mother has high lead levels in her body and exposure can cause premature birth and low birth weight. Recent evidence indicates that exposure to low levels of lead, below those currently considered safe, may lead to neurological damage. Other health effects associated with high-level or long term low-level lead exposure include reproductive effects (miscarriage and infertility), effects on the gastrointestinal tract (abdominal cramps and vomiting) and effects on the immune system. Some evidence indicates that lead can increase blood pressure or cause cancer (e.g., kidney tumors in animal studies).

Although lead has been banned from gasoline since 1996 and residential house paint since 1978, the Centers for Disease Control estimates that nearly 1 million children between the ages of 1 and 5 have blood lead levels above 10 ug/dL (the level of medical and legal concern) due to leaded gasoline residues and from leaded paint chips and dust. The annual cost for treatment of childhood lead poisoning

Common Uses

Lead is commonly used in cathode ray tubes (CRTs) in television sets and computer monitors and in lead acid batteries, which are largely recycled. Lead also is widely used in many consumer products, including blinds, pipes, and rain coats; ammunition; fishing sinkers; chimney flashing; and boat keels.

Lead is used in several manufacturing processes, including as a stabilizer in PVC coating used on cable and as a surface coating on printed wiring boards (both used in electronics, such as computers). Of the more than 11 million pounds of lead and lead compounds used by Massachusetts manufacturers in 2000, 3.7 million pounds were used by the plastics and rubber industries and more than 4.8 million pounds were used by wire and cable industries (mostly as a stabilizer in PVC-coated cable). Approximately 1.1 million pounds of lead and lead compounds were used in metals, including costume jewelry, and 114,000 pounds were used in electronics. It is estimated that the average personal computer contains 3 pounds of lead, including lead in plastic and solder used for assembly and lead-containing PVC coating on cable.

Alternatives

Many industrial applications substitute other metals or organic compounds for lead. Safer, more cost-effective alternatives for lead-based surface finishing are available, including immersion silver and immersion tin processes. Tin-copper-silver is being evaluated as an alternative to tin-lead solder, while calcium zinc soaps and other compounds are available as substitutes for lead stabilizers in PVC used in the wire and cable industry. Alternative plastic stabilizers, including other metals, also have been developed. Alternatives for lead in cathode ray tubes exist, including flat screen technologies.

A recent directive will prohibit most uses of lead in electronics and electrical equipment in the European Union by 2006.

References

Agency for Toxic Substances and Disease Registry. 1997. Toxicological profile for lead. U.S. Department of Health and Human Services, Public Health Service.

Childhood Lead Poisoning Prevention Program. 2003. Top 10 questions asked about lead poisoning and the lead law. Massachusetts Department of Public Health http://www.state.ma.us/dph/clppp/ledtop10.htm.

Greiner Environmental, Inc. 2002. Environmental, health and safety issues in the coated wire and cable industry: Technical report no. 51. The Massachusetts Toxics Use Reduction Institute: University of Massachusetts Lowell. http://http://www.turi.org/PDF/Wire_Cable_TechReport.pdf.

International Programme on Chemical Safety. 1999. International chemical safety cards: Lead. http://www.cdc.gov/niosh/ipcsneng/neng0052.html.

Jorgensen, C. 2000. Lead-free electronics: They're here to stay. http://www.turi.org/messages/lead_free_electronics.htm.

Lead Action News. 2003. Health impacts of lead poisoning. http://www.lead.org.au/fs/fst7.html.

Lead Use and Alternatives. 2002. TURP Talk. http://www.turi.org/PDF/turptalkleadfreefinal.pdf.

National Toxicology Program. 2001. Report on carcinogens: lead acetate and lead phosphate (9th ed.). U.S. Department of Health and Human Services, Public Health Service.

U.S. Environmental Protection Agency (EPA). 2001. Alternative technologies for surface finishing: Cleaner technologies for printed wiring board manufacturers. http://www.epa.gov/dfe/pubs/pwb/tech_rep/Surface_Finishing.pdf.

Additional Resources

Agency for Toxic Substances and Disease Registry (ATSDR): http://www.atsdr.cdc.gov/tfacts13.pdf

IPC: Association Connecting Electronics Industry: http://www.leadfree.org

Massachusetts Toxics Use Reduction Institute (TURI): http://www.turi.org