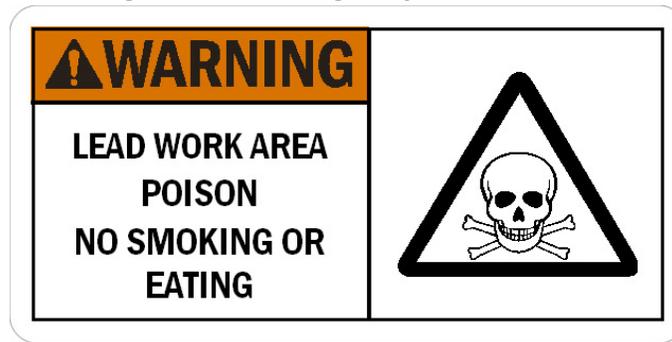


OCCUPATIONAL LEAD EXPOSURE AT DUKE

Information for personnel



Lead Basics

Lead (Pb)

Pure lead is a heavy metal at room temperature and pressure and is a basic chemical element. The main exposure routes are through inhalation of dust, fumes, or mist and the incidental ingestion of dust from contaminated hands, food, make-up, or cigarettes. Occupational exposure to lead is covered under the Occupational Safety and Health Administration (OSHA) lead standard 29 CFR 1910.1025.

Occupational Exposure Routes

Inhalation of airborne lead is generally the primary source of occupational lead exposure. Exposure to lead occurs in at least 120 different occupations, including primary and secondary lead smelting, lead storage battery manufacturing, lead pigment manufacturing and use, solder manufacturing and use, shipbuilding and ship repairing, auto manufacturing, and printing.

Health Hazards

The amount of lead in the blood and tissues, as well as the time course of exposure, determines toxicity. Lead is a potent, systemic poison that once ingested or inhaled gets into your blood stream and accumulates in various organs and body tissues including the heart, bones, intestines, kidneys, and reproductive and nervous systems. Lead adversely affects numerous body systems and causes forms of health impairment and disease that arise after periods of exposure as short as days or as long as several years. Some of the lead is excreted from your body, but if you absorb more lead than your body can eliminate, the amount in your body increases. The lead stored in your tissues can slowly cause irreversible damage. Parents who are exposed to lead in the workplace can bring lead dust home on clothes or skin and expose their children. Lead is particularly toxic to children, interfering with the development of the nervous system.

Lead Sources at Duke

A primary source of lead exposure at Duke is from the handling of a low melting metal alloy composed of lead (27%), bismuth (50%), tin (13%), and cadmium (10%), which is used to prepare radiation shielding blocks for patients. This activity takes place in a dedicated room called the block room. Fumes of lead oxide are generated by the molten metal and can be inhaled along with airborne particulates generated from the block filing process. Exposure to surface particulates can contaminate clothing and potentially be ingested. OESO conducted air monitoring of this procedure and determined that airborne concentrations of lead are well below OSHA's Permissible Exposure Limit (PEL).

Health Effects

Short Term (Acute) Exposure

High exposures to lead may cause neurological signs such as pain, muscle weakness, paraesthesia, and encephalitis. Encephalitis can lead to seizures, coma, and death from cardio respiratory arrest. Other acute symptoms are abdominal pain, nausea, vomiting, and gastrointestinal problems. Absorption of large amounts of lead over a short time can cause shock,

hemolysis, and damage to the kidneys. In adults, about 35-40% of inhaled lead dust is deposited in the lungs, and about 95% of that goes into the bloodstream. People who survive acute poisoning often go on to display symptoms of chronic poisoning.

Long Term (Chronic) Exposure

Chronic overexposure to lead may result in severe damage to your blood-forming, nervous, urinary, and reproductive systems and may pose risks to developing fetuses.

Chronic overexposure to lead may result in severe damage to your blood-forming, central nervous, urinary, and reproductive systems which can result in encephalitis, kidney disease, impotence, sterility, miscarriage, birth defects, and anemia. Some common symptoms include loss of appetite, metallic taste in the mouth, anxiety, constipation, nausea, pallor, excessive tiredness, weakness, insomnia, headache, nervous irritability, muscle and joint pain or soreness, fine tremor, numbness, dizziness, hyperactivity and colic with severe abdominal pain. Some symptoms do not appear until permanent damage has occurred.

Safety Practices

Personal Protective Equipment (PPE)

To protect employees against all potential hazards related to the block preparation (burns from the hot liquid metal, cuts/abrasions from file, exposure to metal particulates, and impact/compression from falling metal blocks), the following PPE is recommended: long sleeved lab coats, goggles, disposable shoe covers, protective toe caps or safety toed shoes, and thermal or leather gloves. All PPE must be stored in the block room.

Housekeeping

The OSHA lead standard requires that all surfaces shall be maintained as free as practicable of accumulations of lead. Proper clean-up of accumulated dust must be accomplished by wet cleaning or using a dedicated HEPA-vacuum: not by sweeping (wet or dry), shoveling or brushing. As an extra precaution, tacky mats can be installed at the door threshold to capture metal particulates and keep them from being tracked outside the room.

Disposal

Contaminated clothing, waste, scrap, or debris can be disposed of in a non-regulated waste stream.

First Aid Procedures

Get MEDICAL ATTENTION immediately after exposure to lead by inhalation or ingestion. Report any lead exposures to your supervisor and through the [Report of Work-Related Accident, Injury or Illness](#) on the Duke Human Resources website.

Lead poisoning is more of a chronic problem unless there is a drastic amount involved. If lead poisoning is suspected in the workplace, employees should notify their supervisor and report to Employee Occupational Health and Wellness (EOHW).

Skin

Remove contaminated clothing and wash the affected area with soap and large amounts of water for at least 15 minutes.

Eyes

Rinse the eyes immediately with large amounts of water, occasionally lifting lower and upper lids, for at least 15 minutes.

OSHA Lead Standard 29 CFR 1910.1025 Highlights

The OSHA lead standard 29 CFR 1910.1025 applies to all occupational exposure to lead (elemental, all inorganic lead compounds, and organic lead soaps) not related to the construction industry or agricultural operations covered by 29 CFR Part 1928. The standard does not apply to other organic lead compounds.

Appendices A and B

Each employer who has a workplace in which there is a potential exposure to airborne lead at any level shall inform employees of the content of Appendices A (Substance data sheet for occupational exposure to lead) and B (Employee standard summary) of the OSHA lead standard.

Permissible Exposure Limit (PEL)

The PEL set by OSHA is 50 micrograms of lead per cubic meter of air ($50 \mu\text{g}/\text{m}^3$) averaged over an 8-hour workday.

Action Level

There is an Action Level of $30 \mu\text{g}/\text{m}^3$ that triggers periodic monitoring, medical surveillance and training.

Exposure Monitoring

If there is a potential to expose employees to lead, OSHA requires air monitoring to determine whether exposure is at or above the action level of $30 \mu\text{g}/\text{m}^3$. If your exposure is over the action level but below the PEL, air monitoring must be repeated every six months. If your exposure is over the PEL, air monitoring must be repeated every three months. Additional monitoring is required if there is a change in process or control equipment that could increase lead exposures.

Medical Surveillance

Medical surveillance must be provided for employees exposed to lead above $30 \mu\text{g}/\text{m}^3$ (Action Level) for 30 or more days per year. Only medical surveillance can determine if the other provisions of the standard have effectively protected exposed employees.

Respiratory Protection

Respiratory protection is required when exposure to lead is not controlled below the PEL by other means.

Personal Protective Equipment (PPE)

If employees are exposed to lead above the PEL, or to lead compounds such as lead arsenate or lead azide which can cause skin and eye irritation, employers must provide appropriate PPE.

Training

Employees must receive training prior to or at the time of their initial assignment to a position that involves potential exposure to lead at or over the action level or potential skin or eye irritation and at least annually thereafter.

Methods of Compliance

Duke uses ventilation, proper work practices, and PPE to control exposure.

Hazard Communication

The following warning signs shall be posted in each work area where the PEL is exceeded: Warning, Lead Work Area, Poison, No Smoking or Eating.

Hygiene Facilities and Practices

In areas where the PEL is exceeded, there shall be no food, beverages, or tobacco present, and no cosmetics applied. Change rooms, showers, and filtered air lunchrooms must be made available to employees exposed above the PEL. No clothing or equipment worn during exposure above the PEL shall be worn home, including shoes and underwear.

Recordkeeping

Employers must keep all records of exposure monitoring for 40 years, or for at least 20 years after employee termination, whichever is longer.

The OSHA lead standard (29 CFR 1910.1025) can be viewed at: <http://tinyurl.com/OSHA-Lead-Standard>.

Questions?

Call the Occupational and Environmental Safety Office (OESO) for information on the following topics:

- Recommendations for appropriate Personal Protective Equipment (PPE) for your job
- Air monitoring or surface sampling for lead
- Health effects of lead

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