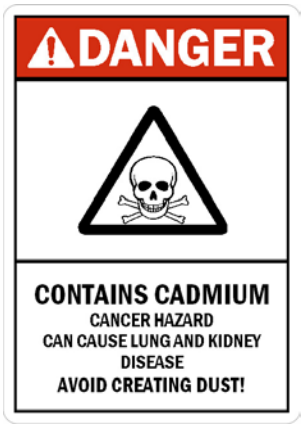
CADMIUM EXPOSURE AT DUKE

Information for personnel



Cadmium Basics

Cadmium (Cd)

Cadmium is a naturally occurring element existing as a soft, silver-white metal or grayish-white powder that can exist as elemental cadmium, oxide, sulfide, and chloride. The main exposure routes are through inhalation of dust and fumes and the incidental ingestion of dust from contaminated hands, food, or cigarettes. Occupational exposure to cadmium is covered under the Occupational Safety and Health Administration (OSHA) cadmium standard 29 CFR 1910.1027.

Health Hazards

Cadmium is much more dangerous by inhalation than by ingestion. The primary and most serious adverse health effects of long-term exposure to cadmium include kidney dysfunction, lung cancer, and prostate cancer.

Cadmium Sources at Duke

The primary source of cadmium 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 cadmium 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 cadmium are well below the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limits (PEL).

Health Effects

Short Term (Acute) Exposure

Inhalation

High exposures to cadmium can cause delayed pneumonitis with fever and chest pain, pulmonary edema resulting in death, and may be immediately dangerous to life or health in jobs where workers handle large quantities of cadmium dust or fume, heat cadmium-containing compounds or cadmium-coated surfaces, weld with cadmium solders or cut cadmium-containing materials.

Ingestion

Ingestion may result in vomiting, abdominal pain, nausea, diarrhea, headache and sore throat.

Skin/Eyes

Direct contact may result in irritation, redness or pain.

Long Term (Chronic) Exposure

Cadmium is a known human carcinogen. The risk becomes greater as the concentration and duration of exposure increase.

Inhalation

Chronic exposure may be linked to several adverse health effects including kidney dysfunction, reduced pulmonary function, chronic lung disease, lung, and prostate cancer.

Ingestion

Ingested cadmium may cause adverse health effects such as kidney dysfunction. Cadmium is slow to eliminate from the body and ultimately accumulates in the kidney and liver.

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 cadmium standard requires that all surfaces shall be maintained as free as practicable of accumulations of cadmium. 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.

Storage and Disposal

Shipping and storage containers containing cadmium, cadmium compounds, or cadmium contaminated clothing, waste, scrap, or debris, shall bear appropriate warning labels with the following information: DANGER, CONTAINS CADMIUM, CANCER HAZARD, CAN CAUSE LUNG AND KIDNEY DISEASE, AVOID CREATING DUST. Contact OESO Environmental Program Services for pick-up of the cadmium waste.

First Aid Procedures

Get MEDICAL ATTENTION immediately after exposure to cadmium by inhalation, ingestion, or skin. Report any cadmium exposures to your supervisor and using the Report of Work-Related Accident, Injury or Illness on the Duke Human Resources website.

Ingestion

Treatment for symptoms must be administered by medical personnel.

Inhalation

If large amounts of cadmium are inhaled, move the person to fresh air at once. If breathing has stopped, perform CPR and call 911.

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 Cadmium Standard 29 CFR 1910.1027 Highlights

The OSHA cadmium standard 29 CFR 1910.1027 applies to all occupational exposures to cadmium compounds, in all forms, and in all industries covered by the Occupational Safety and Health Act, except the construction-related industries, which are covered by 29 CFR 1926.63.

Permissible Exposure Limit (PEL)

For an 8 hour workday, employee average exposure to airborne levels of cadmium compounds, dust, and fumes, must be under 5 micrograms of cadmium per cubic meter of air (5 $\mu g/m^3$). There is an Action Level of 2.5 $\mu g/m^3$ that triggers periodic monitoring and medical surveillance.

Exposure monitoring

If there is a potential to expose employees to cadmium, OSHA requires air monitoring to determine whether exposure is at or above the action level of 2.5 $\mu g/m^3$. Additional monitoring is required if there is a change in process or control equipment that could increase cadmium exposures.

Medical Surveillance

Medical surveillance must be provided for employees exposed to cadmium at or above 2.5 $\mu g/m^3$ (action level) for 30 or more days per year (or in a 12-month consecutive period).

Information and Training

Employees must receive training prior to or at the time of their initial assignment to a position that involves potential exposure to cadmium and at least annually thereafter. The training covers the health hazards, potential cadmium exposure, safe work practices, emergency procedures, PPE, medical surveillance program, and access to the cadmium standard and its appendices.

Methods of Compliance

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

Hazard Communication

Warning signs must be displayed in regulated areas and labels area required for containers that contain cadmium, cadmium compounds, or cadmium-contaminated clothing, waste, equipment, scrap, or debris. Material Safety Data Sheets must be available in your work area.

Recordkeeping

The employer must retain air monitoring records for 30 years, medical surveillance records for the duration of the employee's employment with the company plus 30 years, and training records for one year after the training.

The OSHA cadmium standard (29 CFR 1910.1027 can be viewed at: http://tinyurl.com/OSHA-Cadmium-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 cadmium
- Health effects of cadmium

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