

Toxic Metals- Safe Work Practices

While many elements that are considered heavy metals have no known benefit for human physiology (e.g., lead, mercury, cadmium), others are essential to human biochemical processes (e.g., zinc, iron, cobalt). When heavy metals are taken up and stored faster than they are broken down or excreted, they can bio-accumulate in body tissues and reach toxic concentrations. The toxicity of heavy metals depends on a number of factors including the dose (acute or chronic), frequency and route of exposure, and the age and health-status of exposed individuals. The following is a list of commonly used toxic metals at the University. This list is not comprehensive.

Aluminum	Iron
Antimony	Lead
Arsenic	Manganese
Barium	Mercury
Beryllium	Molybdenum
Bismuth	Nickel
Boron	Selenium
Cadmium	Silver
Chromium	Tin
Cobalt	Vanadium
Copper	Zinc

In general, heavy metals bind to oxygen, nitrogen, and sulfhydryl groups in proteins, resulting in alterations of enzymatic activity. As a result, almost all organ systems are involved in heavy metal toxicity. Overexposure to toxic metals can impair function in the heart, liver, blood, intestines, kidneys and skin as well as disrupt processes of the immune, endocrine, central nervous and peripheral nervous systems. Many heavy metals are also recognized as being acutely toxic, germ cell mutagens, carcinogens or capable of causing adverse effects on sexual function and fertility. The negative physiological and neurological health effects associated with exposure to heavy metals makes safe work practices of critical importance.

Safe Work Practices

The following measures should be taken by researchers working with toxic metals:

- Read the **safety data sheet (SDS)** for each toxic metal or metal compound prior to use.
- Eliminate, substitute less toxic chemicals or reduce the quantities of toxic metals being used if possible.
- Work with toxic metals in a chemical fume hood, glove box or with other types of local exhaust ventilation.
- Wear personal protective equipment as indicated by safety data sheets or the lab's [workplace hazard assessment form](#) .
- Ensure containers are clearly labeled and inspect containers for leaks or damage prior to use.
- Store toxic metals in tightly-sealed containers away from incompatible materials.
- Corrosive, toxic metals (e.g. mercury) should be stored below eye level.
- Do not return contaminated or unused material to the original container.
- Ensure that emergency eyewash/shower stations are readily available.
- Ensure that all waste containers are compatible with the toxic metals and that the containers are properly labeled and stored.

Additional Resources

Agency for Toxic Substances and Disease Registry- ATSDR Toxic Substances Portal

<http://www.atsdr.cdc.gov/substances/index.asp>

Environmental Protection Agency- Hazardous Waste Characteristics

<http://www.epa.gov/osw/hazard/wastetypes/wasteid/char/hw-char.pdf>

Occupational Safety & Health Administration- Toxic Metals

<http://www.osha.gov/SLTC/metalsheavy/index.html>