Mercury Use & Reduction

Mercury is considered a dangerous environmental toxin that is found in many consumer and commercial products, as well as in laboratory equipment. The ability of mercury to bioaccumulate in the environment makes it particularly harmful to humans and other living species. Mercury vapors, which can result from spilled liquid mercury, is colorless and odorless, and has potentially toxic effects on individuals. Due to mercury being one of the most commonly spilled chemical products, the JABSOM Kaka'ako policy is to reduce mercury sources from its laboratories.

1. HEALTH EFFECTS (Refer to the Material Safety Data Sheet for Mercury.)

Mercury vapor is highly toxic and can be inhaled, causing adverse health effects including damage to the gastrointestinal tract, the nervous system, and/or kidneys. Vapors can be absorbed through inhalation with symptoms similar to ingestion. Symptoms can include tremors, psychological changes (mood swings, irritability, nervousness), insomnia, neuromuscular changes (weakness, muscle atrophy, twitching), headaches, disturbances in sensations, and changes in nerve response. High exposure to mercury may result in kidney failure, respiratory problems and death. Anyone concerned about their exposure to metallic mercury should consult their physician.

2. COMMON MERCURY SOURCES IN LABORATORIES & ALTERNATIVES

Traditionally, **mercury thermometers** have been the standard for measuring temperature over a wide range. However, broken thermometers can result in mercury vapors that present an environmental and health hazard to personnel working in these areas, as well as costs associated with spill clean-up and waste disposal. Accurate, non-toxic, non-mercury thermometers are now available and accepted as an adequate alternative to mercury thermometers. These alternative thermometers generally use an alcohol based solution, red or blue in color, as the temperature indicator. **At no cost to JABSOM researchers, JABSOM EHSO will exchange mercury thermometers for safe, non-toxic alternatives.**

There are other sources of mercury in the lab that most researchers are not aware of. Mercury is also commonly found in laboratory equipment such as manometers, pressure gauges, light switches, sphygmomanometers, UV lamps/bulbs, and microscope light bulbs. Some of these sources may contain larger quantities of mercury, therefore presenting a greater environmental and occupational risk.

JABSOM EHSO supports the removal and replacement with non-mercury equipment whenever possible.

See Table 1.0 for alternatives to mercury-based chemicals and Table 1.1 for alternatives to mercury-containing materials and equipment.

3. EXCEPTIONS

An essential use of mercury is defined as a situation in which no feasible alternatives are available. In cases where an alternative is not feasible, mercury thermometers must be Teflon-coated to prevent mercury release in the event of breakage.

4. MERCURY USE REQUIREMENTS

Mercury spill response: If a lab uses mercury or uses mercury thermometers, the lab must purchase and stock a mercury spill kit. In addition to the mercury spill kit, the lab must post mercury spill response procedures and provide training to all researchers in the lab.

Mercury SOP: If a lab handles liquid mercury metal, the lab must develop and implement a standard operating procedure addressing the hazards, handling, storing, safety precautions, incident response, and disposal procedures.

5. WASTE DISPOSAL/EMERGENCY PROCEDURES

All incidents of mercury spills must be reported to the JABSOM Environmental Health & Safety Office (692-1854 / 692-1855). JABSOM EHSO will also accept the disposal of mercury containing products for proper hazardous waste disposal.

TABLE 1.0 – CHEMICALS

Materials/Equipment	Purpose	Alternative(s)*
Mercury (II) chloride (Zenker's solution, histological fixatives)	Fixative	Zinc formalin, freeze drying
Mercury (II) oxide		Copper catalyst
Mercury chloride		
Mercury (II) chloride		Magnesium chloride/sulfuric acid or zinc formalin, freeze drying
Mercury (II) sulfate		Silver nitrate/potassium/ chromium-(III) sulfate
Mercury iodide		Phenate method
Mercury nitrate (for corrosion of copper alloys)		Ammonia/copper sulfate
Mercurochrome		Neosporin, mycin
Thimerosal	Preservative	Sodium azide/Proclain
Toxi-Dip B3 reagent	Drug screening	Gas chromatography / mass spectrometry, microgenics
Harris hematoxylin (mercuric oxide)		Sodium idoate, copper catalyst

***Some of these alternatives are hazardous chemicals.**

TABLE 1.1 – MATERIALS/EQUIPMENT

Materials/Equipment	Purpose	Alternative(s)
Thermometers (contain up to 0.5 grams of Hg)	Temperature, incubator/water bath	Digital/electronic, alcohol, infrared aural
Sphygmomanometers (contain up to 70 grams of Hg)	Blood pressure cuffs	Aneroid, electronic, expansion
Batteries (mercury oxide, mercury cadmium)	Defibrillator	Lithium, zinc air, alkaline
Thermostats	Ovens, incubators, refrigerators, room temperature controls	Electronic, pneumatic, alcohol (refrigerators)
Lamps (fluorescent, UV, high-intensity)	Lighting & Germicidal	Low sodium vapor tubes, ordinary glow lights, high energy, long-lasting lights
Refrigerator thermometer	Temperature	Alcohol, digital
Switches	high current/voltage lighting, power supply switching, measurement equipment.	Mechanical, pressure
Boiling and cooling tower chemicals (caustic soda)	Treatment and pH control	Higher grade (non-mercury)
Electrical equipment		Fiber optics, solid state devices, mechanical switches
Analytical instruments (mercury chloride as reagent)	SMAC, AU 2000	Ion selective electrode (ISE)

References: Penn State, EPA, Indiana University-Purdue University at Indianapolis, U. of Illinois at Urbana-Champaign