
Reducing Mercury Use at Your Facility

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Presentation Objectives



- Describe the problems with mercury use
- Identify mercury-containing products and alternatives
- Outline steps to creating a mercury reduction program
- Highlight mercury reduction successes at universities
- Provide informational resources

What is mercury?



- Naturally occurring element in the environment
- Known as “Hg” to chemists (also known as liquid silver or quicksilver)
- Heavy metal
- Shiny, silvery-white liquid
- Only metal that is liquid at room temperature
- Produces odorless vapors
- Clings to textiles and fabrics
- Found in everyday items
- Highly toxic (“PBT”)

What makes mercury unique?

- **Has diverse chemical and physical properties**
 - Conducts electricity
 - Expands and contracts in response to changes in temperature and pressure
 - Heavy and dense compared to water and other liquids
 - Combines with other metals to form alloys known as amalgams
 - Acts as a biocide, preservative and disinfectant
 - **Makes it useful for a variety of household, medical and workplace applications**
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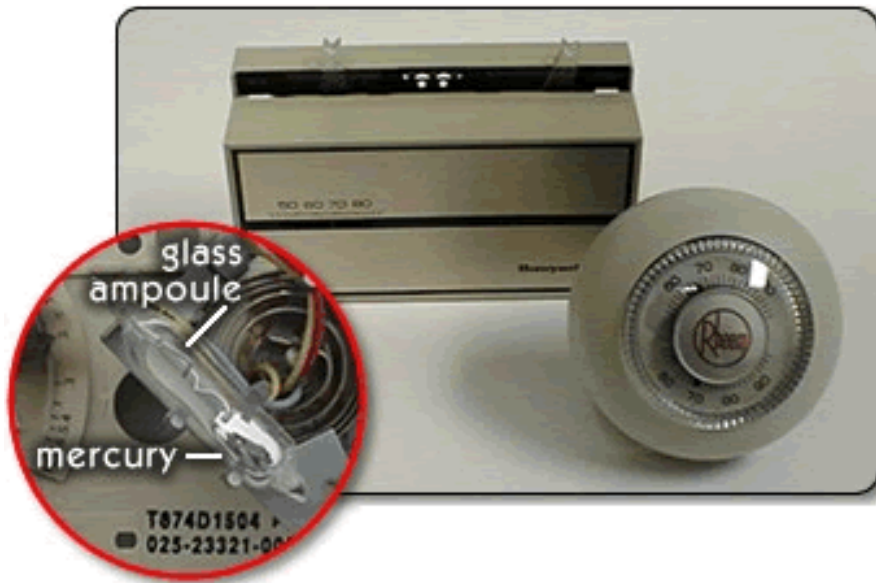
Where can mercury be found?



Examples of some products that contain mercury.

- Laboratory
 - Manometers, pressure gauges
 - Barometers
 - Thermometers
 - Flow meters
 - Lab solutions
- Health Care
 - Thermometers
 - Blood pressure gauges
 - Gastrointestinal tubes

Mercury-containing products



- Buildings
 - Thermostats
 - Flame sensors (pilot light and burner assembly on gas-fired furnaces, unit heaters and space heaters)
 - Switches and relays (float, mechanical tilt or temperature-sensitive switches; and displacement plunger or mercury wetted relays)
- Lamps
 - Fluorescent
 - Metal halide
 - High-pressure sodium

Mercury-containing products



Examples of various sized button cell batteries.

- Other
 - Old pesticides, fungicides and herbicides
 - Tree root growth control products
 - Computer monitors
 - Low pressure gauges for testing gas piping and vent systems
 - Certain fleet vehicles (pre-2002) with hood and trunk lighting tilt switches
 - Old latex paint (pre-1990)
 - Button cell batteries (round type batteries found in watches, hearing aids, calculators and watches)

How can you be exposed to mercury?



- Exposure through inhalation or skin contact when mercury is spilled or a device containing mercury breaks
- Exposure from leaking equipment or improperly sealed container
- If not properly discarded, (placed in trash or poured down the drain), mercury can:
 - Enter the environment
 - Be transformed into a more toxic organic form – methyl mercury
 - Buildup and concentrate in food chain
 - Be ingested by eating contaminated fish

Why is mercury a concern?



- When spilled, breaks into tiny beads that can roll into cracks or crevices in floors or become trapped in weave of carpeting
- If spilled in or around heating ducts, can quickly vaporize and possibly spread throughout the facility
- Mercury and its vapors are difficult to remove from clothes, furniture, carpet, floors and walls.
- If not properly cleaned up, will slowly evaporate at room temperature, causing continuous contamination

How can mercury vapors affect your health?

- Short term exposure to high concentrations may cause, **nausea, chest pains, shortness in breath and bronchitis**
 - Long term exposure (repeated or prolonged exposure) can result in effects that develop gradually, including **shakiness, tremors, numbness in fingers and toes, loss of muscle control and short-term memory loss**
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Mercury spill incident: *Minnesota State University - Moorhead*

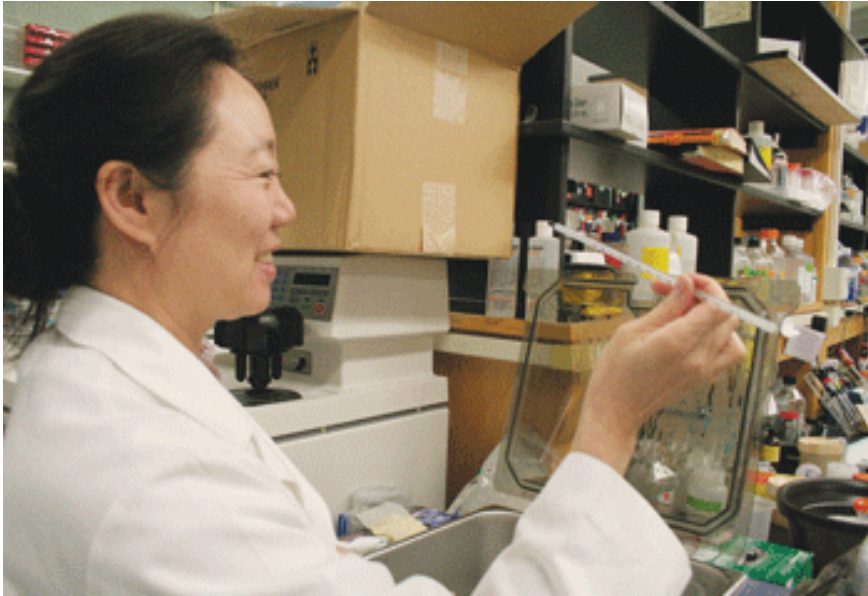


- Custodian wheeling cart carrying liquid mercury
- Spill consisted of three quarter size drops
- Occurred one hour before classes were to begin
- Before area was closed off, 100 people (staff, custodians and students) were quarantined
- Two adjoining buildings that shared same ventilation system and campus maintenance building were closed
- Shoes and socks tested for mercury
- Classes were cancelled for the day

Mercury spill incident: *Northeastern Illinois University*

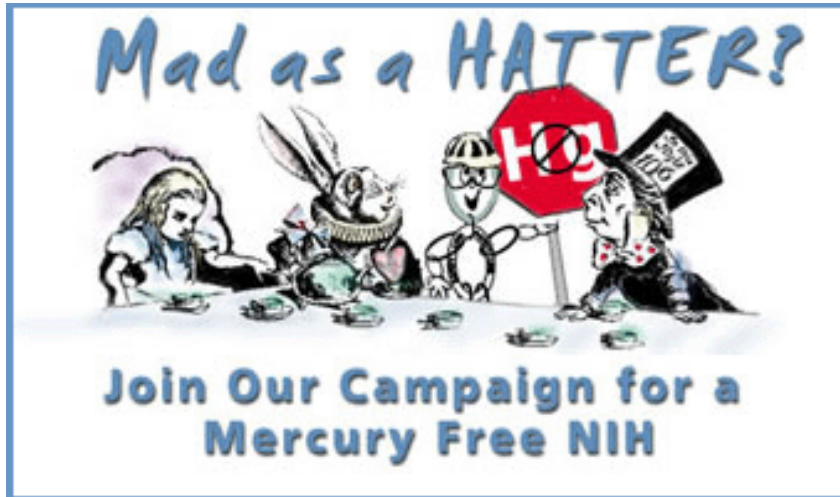
- A spill of six pounds of mercury discovered in storage room by student worker
 - Suspect old manometer or barometer from science department leaked or broke when it was moved
 - Hired contractor to remove mercury along with six 55-gallon drums of contaminated material
 - Cleanup cost was \$44,000
 - Revised mercury safety policies
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What can be done about mercury?



- Educate
- Identify use
- Consider alternatives
- Remove/recycle unnecessary mercury
- Replace equipment that has mercury
- Change purchasing policies

Eliminating mercury devices will:



- Help protect health of staff and students
- Reduce clean-up costs for spills and instrument disposal
- Eliminate inconvenience caused by remediation efforts
- Protect the environment

Creating a Mercury Reduction Program

- Set goal (e.g., mercury elimination by January 2010)
 - Develop a team
 - Educate faculty, housekeeping and students
 - Conduct facility-wide mercury inventory (equipment and MSDS review)
 - Develop departmental replacement schedules for all devices that have non-mercury alternatives, using inventory form
 - Ensure proper disposal of old mercury-containing devices
 - Update procurement specifications to purchase mercury-free or low mercury products, where no acceptable alternatives exist
 - Label remaining mercury-containing equipment or products
 - Have mercury spill plan
 - Consider drain trap clean-outs
 - Track mercury reduction progress and make changes as necessary
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Sample Mercury Instrument Inventory and Replacement Form: *Southwestern University, Georgetown, TX*

Department: _____

Inventory Date: _____

Department Contact: _____

Lab/Rm#	Mercury Instrument	Replacement description	Cost	Schedule	Completed

Laboratory Alternatives to Mercury:

University of Calgary

Mercury Item	Mercury-free Alternative
Mercury Vacuum Gauge	Needle or Digital
Mercury Thermometer	Alcohol and mineral spirits glass bulbs, digital
Mercury Hygrometer	Spirit-filled glass bulb, digital or aneroid
Mercury Compounds – mercury chloride (Zenker's solution), mercury iodide, mercury nitrate, mercury oxide, mercury sulfate	Magnesium Chloride/Sulfuric Acid or Zinc Formalin Freeze Drying Method, Ammonia/Copper Sulfate, Mycin Copper Catalyst Silver Nitrate/Potassium/Chromium Sulfate
Colorimetric Chloride Analysis	Ion-selective electrode method

Low or Mercury-Free Alternatives for Facilities, Equipment and Supplies: *National Institutes of Health*

Mercury Item	Alternative
Thermostat	Electronic, snap switches, thermostat with bi-metallic strip
Displacement/Plunger Relays and Tilt Switches	Mechanical and solid state relays, mechanical switches, magnetic dry reed switches, optic sensors
Water treatment chemicals (contaminant in sodium hydroxide, sulfuric acid)	Low-mercury content chemicals from alternate supplies, alternative neutralizing chemicals (hydrochloric acid)
Lamps	Low mercury fluorescent, high intensity discharge, mercury and lead free high pressure sodium lights

Mercury Phase-out Program: *University of Rochester, Strong Memorial Hospital*

- 750-bed primary teaching hospital for school of medicine and dentistry
 - Created multi-disciplinary workgroup
 - Documented mercury use by surveying departments, reviewing MSDSs, material distribution records and contacting vendors
 - Created baseline for usage of mercury-containing materials
 - Notified staff
 - Identified areas for reduction and replacement
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Mercury Phase-out Program: *University of Rochester - Strong Memorial Hospital*

- Replaced mercury-containing devices with:
 - Non-mercury thermometers -- electronic, tympanic and alternative alloy (reduced mercury thermometer use by 90%)
 - Aneroid blood pressure monitors (900 non-mercury devices now in use)
 - Tungsten-filled gastrointestinal tubing
 - Created recycling programs for batteries and fluorescent lamps
 - Improved staff training and labeling of waste containers
 - Lowered waste disposal costs for mercury spills from two 55-gallon size drums per quarter costing \$3,000 per drum to less than a 5-gallon size pail, costing \$335
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Mercury Thermometer Replacement Program: *Penn State University*

- Thermometers used for research and medical purposes
 - 2-3 mercury spills a week from broken thermometers
 - Clean up cost: \$200 to \$500 (staff time and disposal)
 - Initiated thermometer exchange program (\$50,000)
 - Switch to thermometer with liquid made up of white oil, natural citrus oils and green dye
 - Collected more than 7,000 thermometers, containing 400 pounds of mercury
 - Reduced mercury spills by $\frac{3}{4}$, with projected savings of \$10,000 annually
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Mercury Reduction Program: *University of North Carolina*

- Created catchy slogan: “Mercury Free at UNC”
 - Goal: reduce and eliminate use of elemental mercury
 - Managed by EH&S Department
 - Encourages faculty and students to sign a pledge form to minimize mercury use:
 - Become more aware of mercury hazards and how to reduce them
 - Survey workplace for mercury-containing items and replace with mercury-free or low-mercury products
 - Report spills promptly
 - Dispose of mercury waste properly
 - Provides funding of up to 100% for the purchase cost of mercury free replacements
 - Over 80 staff have signed the pledge, representing pharmacy, biology, chemistry, dental research, pediatric, pathology, nursing, marine science and other departments/schools.
 - Eliminated mercury use in all pharmacy school laboratories
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Mercury Product Laws in Illinois

- Mercury Fever Thermometer Prohibition Act (P.A. 93-0165)
 - Prohibits sale/distribution of mercury fever thermometers, effective July 1, 2004. Does not apply to mercury thermometers sold or provided to be used in a health care facility.
 - Amendment to IL EPA Act (P.A. 93-0964)
 - Prohibits sale of selected mercury switches and relays used in commercial and consumer products (with exceptions), effective July 1, 2007. Allows manufacturers of mercury switches and relays to petition for an exemption.
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Pending Mercury Product Legislation

- HB 943 (May/Hunter)
 - Creates Mercury-added Product Prohibition Act. Prohibits sale/distribution of the following mercury measuring and control devices, effective July 1, 2008:
 - Barometers; esophageal dilators, bougie tubes, or gastrointestinal tubes; flow meters, hydrometers, hygrometers, manometers, pyrometers, sphygmomanometers, thermometers and psychrometers.
 - Allows manufacturers of above mercury-added products to petition for an exemption

 - SB 1241(Hunter/May)
 - Amends the IL EPA Act. Prohibits sale/distribution of mercury switch thermostats used to sense or control room temperature in residential, commercial and industrial buildings, effective July 1, 2008
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Where to get more information?

- Mercury Reduction Programs
 - Southwestern University, Mercury-Free Initiative
 - www.southwestern.edu/fiscalaffairs/stuff/saf/Mercury%20Free.pdf
 - National Institutes of Health, Office of Research Facilities, Mercury Free Campaign
 - <http://orf.od.nih.gov/Environmental+Protection/Mercury+Free/>
 - University of Illinois at Urbana-Champaign, Division of Research and Safety, Program for Reduction of Mercury Use
 - www.drs.uiuc.edu/css/programareas/mercury/
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More informational resources

- Mercury Recyclers

- Illinois EPA

- www.epa.state.il.us/land/fluorescent-lamps/index.html

- Mercury Spills

- Illinois Department of Public Health

- www.idph.state.il.us/envhealth/factsheets/mercuryspills.htm

- U.S. EPA

- www.epa.gov/mercury/spills/index.htm
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