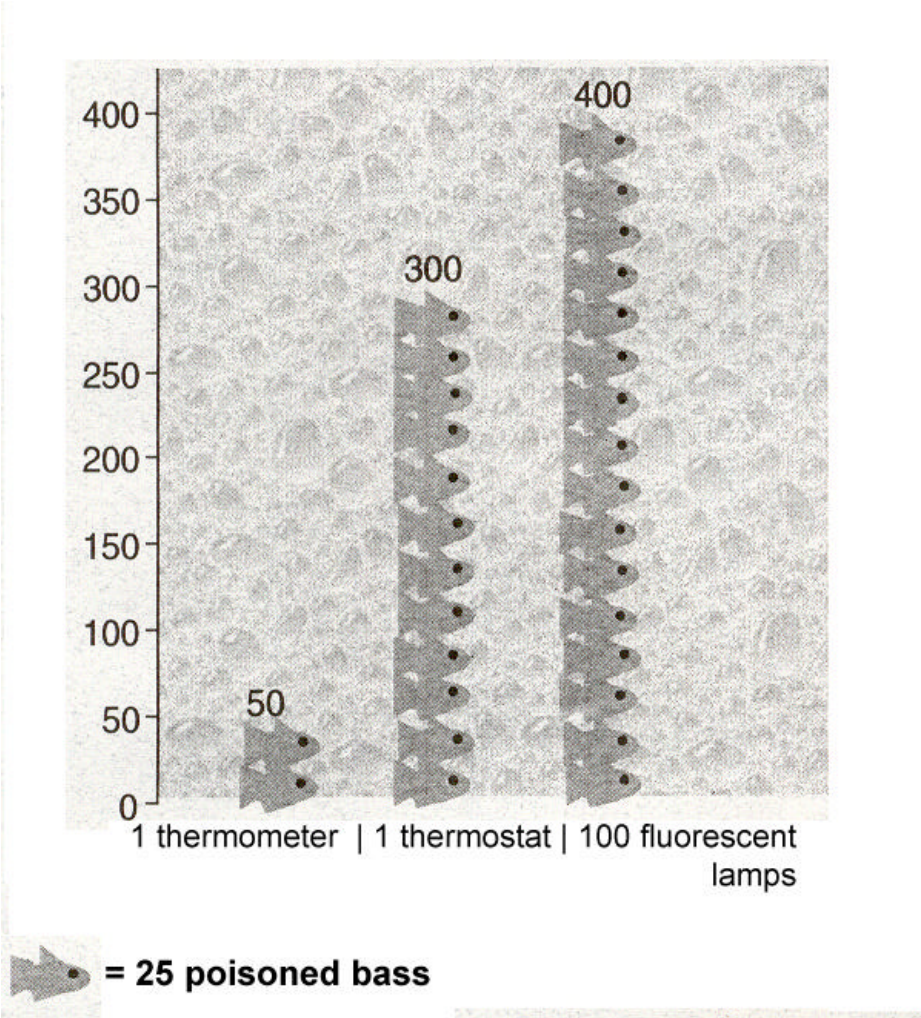
Managing Mercury

Best Management Practices for Florida Medical Facilities

HOW MUCH MERCURY?

A very small amount of mercury can be extremely toxic. This graph illustrates the number of fish potentially poisoned by the mercury contained in a few common hospital items. For example, a typical fever thermometer holds 0.5 grams of mercury, enough to poison 50 fish weighing 36 ounces.[1]



[1] The Terrene Institute, *The Case Against Mercury: Rx. For Pollution Prevention, 1995*.

Why should I care about managing mercury in our facility?

Studies have identified Florida hospital incinerator emissions as a significant source of mercury pollution in our environment.

Hospitals have a responsibility not only to their patients, but to their communities, and can play an active role in preventing illness. Two ways to do this are through recycling and reducing the use of hazardous materials in the facility.

Mercury is present in the hospital in many forms - thermometers, sphygmomanometers, thermostats, switches, gauges, batteries, fluorescent lamps, laboratory stains, and solutions. Mercury in broken or outdated equipment is often improperly discarded as red bag waste, or trash and sent to the incinerator. Incineration causes mercury vapors to escape into the air, starting a trail of pollution with the smallest creatures at the bottom of the food chain ending with those at the top - like us.

This booklet can help you keep your hospital from adding to the problem. It outlines five steps for reducing mercury and mercury waste in your hospital:

1. Communication and education efforts.
2. Identification of sources of mercury in the hospital environment.
3. Proper handling of mercury-containing items to minimize spills.
4. Keeping mercury out of the bio-medical (red bag) and solid waste (garbage) stream.
5. Identification of substitutes and alternatives for mercury containing products.

1 gram of mercury	There is enough mercury - about 1 gram - in 20 fluorescent light bulbs to contaminate a day's supply of drinking water for 1 million people.

1. Communication and Education

...are the first steps in a plan to increase awareness about handling and disposing of mercury and reducing its use in the medical facility. The following steps are a good starting point:

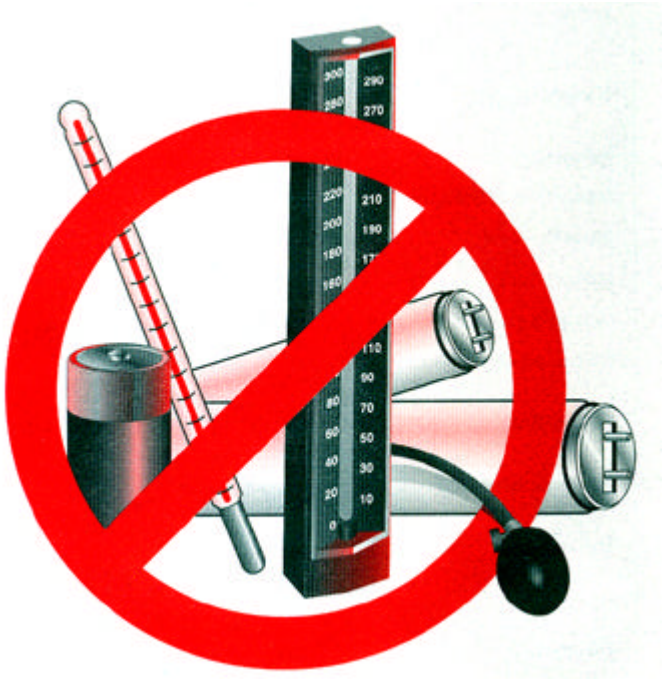
- Develop a broad-based communications program to increase the awareness of the human health and environmental dangers of mercury. Use memos, meetings, newsletters, or a combination of these.
- Include articles about mercury reduction, handling, and proper disposal in staff newsletters.
- Include information about the proper handling of mercury in employee orientation and "Right-to-Know" training.
- Ensure all personnel - including temporary workers - are familiar with mercury-handling procedures to prevent the disposal of mercury-containing items in sharps containers, red bags, or solid waste containers.
- Include information about waste reduction and pollution prevention during in-service training sessions.
- Encourage personnel to be "label readers."
- Place placards or labels stating "NO MERCURY" on or above red bags, sharps containers, and solid waste containers.
- Provide recognizable disposal containers for discarded mercury waste items.
- Make sure mercury spill kits are available in all laboratories, nursing stations, ICU/ER/Surgery suites, patient rooms, and storage/maintenance facilities.

2. IDENTIFY SOURCES OF MERCURY

...by visiting all facility departments. Although thermometers and sphygmomanometers are the most widely used mercury-containing items, mercury is also found in many other products and devices. Employees should know about all the mercury-containing lamps, devices,, batteries, and substances used in their work areas.

The following pages list the products often found in specific areas within a medical facility. Using these lists as a guide, you can develop specific lists including only the mercury-containing items used in each department in your facility.

Post your lists near any biomedical or solid waste container which should not receive mercury-containing wastes. Include instructions on properly managing mercury-containing wastes, for example: "Put these items into the hazardous waste container."



MERCURY SOURCES IN ICU/ER/SURGERY

DO NOT PUT THESE ITEMS IN REGULAR OR RED BAG WASTE

- Canter Tubes
- Feeding Tubes
- Lamps
  - High Pressure Sodium Lamps
  - Fluorescent Lamps
  - Metal Halide Lamps
  - Ultraviolet Lamps
- Mercuric Oxide Batteries Used in:
  - Defibrillators
  - ECG Monitors
  - Fetal Monitors
  - Hearing Aids
  - Hofler Monitors
  - Oxygen Monitors
  - Pacemakers
- Miller Abbot Tubes
- Sphygmomanometers
- Thermometers
- Treatments:
  - Antifungal/Anti-Infectious/Bacteriostatic Enzyme/Ammonia
  - Thimerosal
    - Merthiolate

1 gram of Mercury	A tiny speck of mercury - the size of the period at the end of this sentence - can contaminate a 36-ounce fish. This is about 1/100 of a gram.

MERCURY SOURCES IN LABORATORIES

DO NOT PUT THESE ITEMS IN REGULAR OR RED BAG WASTE

- Electron Microscope
- Fixatives
  - Mercuric Chloride
    - B5 Fixative
    - Carnoy-Lebrun
    - Helly
    - Ohlamacher
    - Shardin
    - Zenker's Solution
- Manometers
- Mercuric Oxide Batteries
- Reagents
  - Camco
  - Hitergent
  - Immu-sal
  - Mercuric Chloride (used in SMAC AU2000)
  - Mercuric Oxide (Stabilur Tablets)
  - Mercury Iodine
  - Mercury Nitrate
  - Mercury Sulfate
  - Mercurochrome
  - Mercurophyline
  - Million's Reagent
  - Nessler's Solution
  - Phenol Mercuric Acetate
  - Takata's Reagent
  - Thimerosol (Buffers, Merthiolate, Mucolex)
- Sewage Traps
- Stains
  - Alum Hematoxylin (Solution A)
  - Cajal's
  - Carbol Gentian Violet
  - Gomori's
  - Golgi's
  - Gram Iodine
  - Mercury Chloride
- Thermometers

MERCURY SOURCES IN NURSING STATIONS

DO NOT PUT THESE ITEMS IN REGULAR OR RED BAG WASTE

Barometers
Cantor Tubes
Electrical Equipment
- Laboratory Ovens
- Nursing Incubators
- Refrigerators
- Relays
- Switches

Feeding Tubes
Lamps
- Fluorescent Lamps
- High Pressure Sodium Lamps
- Metal Halide Lamps
- Ultraviolet Lamps

Mercuric Oxide Batteries Used in:
- Blood Analyzers
- Defibrillators
- Fetal Monitors
- Hearing Aids
- Hofler Monitors
- Pacemakers
- Pagers
- Picker Caliber
- Spirometer Alarm
- Telemetry Transmitter
- Temperature Alarm

Sewage Traps
Sphygmomanometers
Thermometers

1 gram of Mercury	Mercury vapors are odorless & invisible, making it impossible to know when you are in danger.

MERCURY SOURCES IN PATIENTS' ROOMS

DO NOT PUT THESE ITEMS IN REGULAR OR RED BAG WASTE

Electrical Instruments
- Nursing Incubators
- Thermostats

Mercuric Oxide Batteries Used In:
- Defibrillators
- ECG Monitors
- Hearing Aids
- Oxygen Monitors
- Pacemakers
- Temperature Alarm

Sphygmomanometers
Switches
Thermometers

MERCURY SOURCES IN STORAGE AND MAINTENANCE

DO NOT PUT THESE ITEMS IN REGULAR OR RED BAG WASTE

Antifouling Agents
Cleaning Chemicals
Degreasers
Outdated Mercury Containing Equipment
Paints
Preservatives
Sewage Traps
Solvents
Spent Batteries
Spent Mercury-Containing Lamps
Spent Mercury Containing Thermostats

3. PROPER HANDLING OF MERCURY-CONTAINING ITEMS

...can reduce the amount of mercury improperly disposed of in red bags, sharps containers, or regular waste containers. The following lists can be adapted for the departments in your facility.

- Never place any mercury-containing item into a red bag, a sharps container, or a regular waste container.
- Provide separate waste containers for mercury-containing wastes.
- For sphygmomanometers with glass tubes, contact the manufacturer to obtain some inexpensive mylar sheaths that can be easily placed around the tube to prevent spills in case of breakage.
- Keep an up-to-date inventory of mercury-containing items, their arrival, history of use, and final destination.
- Prevent spills. Even small spills result in cleanup and disposal costs. Avoiding spills of large quantities of mercury can help save thousands of dollars in labor, cleanup, and disposal costs.
- Keep an accurate log of mercury spills. Review the log regularly to identify areas where spills occur frequently.
- Keep spilled mercury or broken mercury-containing items in a sealed container such as a sealable plastic bag. Then place that container in a secondary container with a tight-fitting lid.
- Transport mercury-containing substances and devices in a secondary container that can be easily cleaned if a spill occurs. Transfer mercury within the secondary container.
- Ensure that proper equipment is available to clean up spills. Equipment must be appropriate for the size of the facility and types of spills anticipated. If your facility does not have a mercury vacuum aspirator, consider purchasing one. Place mercury spill kits in areas where spills are likely to occur.
- When spill cleanup equipment is located in a central location, such as the safety manager’s office, be sure all personnel know who to call when a spill occurs.

- When spill kits are located in various areas in the facility, be sure all personnel know who to call when a spill occurs.
- When spill kits are located in various areas of the facility, be sure all personnel are familiar with the location and proper use of the nearest spill kit.
- Collect spill cleanup materials and send them to a hazardous waste contractor. They should not be disposed of in red bags or solid waste containers.
- Monitor changes in the volume of mercury on hand - and reductions in use, spill incidents, or mercury recovered.
- Ensure that your hospital has a contract with a hazardous waste disposal company for all mercury-containing wastes that cannot be recycled.
- Handle all mercury containing lamps, batteries, and devices as outlined in the “Universal Waste Rule” (40 CFR 273) and “Management of Spent Mercury-Containing Lamps and Mercury-Containing Devices Destined for Recycling” (Chapter 62-737, F.A.C) Handle all other mercury containing items as hazardous waste under the Hazardous Waste Rule (Chapter 62-730, F.A.C).
- If blood has come in contact with an invasive mercury-containing tube or another mercury-containing device, use an OSHA approved method to remove the blood and other potentially infectious components before disposal.
- For further information on recycling and disposal for mercury-containing lamps and devices, call the Florida Department of Environmental Protection’s toll-free hotline:

1-800-741-4DEP
(1-800-741-4337)

- The following is a “Do and “Don’t” list for handling mercury-containing items. This effective and strongly recommended educational tool can be posted in all areas where mercury-containing items are used.

PROPER HANDLING OF MERCURY

DO:

- **Do** prevent mercury spills
- **Do** transport mercury-containing substances and devices secondary containers that can be easily cleaned if a spill occurs
- **Do** know who to call when a spill occurs.
  Call:_____
- **Do** know where the nearest spill kit is and how to use it
- **Do** keep containers of spilled mercury closed tightly.
- **Do** record all mercury spills on a log sheet
- **Do** record the amount of mercury in use, stored, recovered, and discarded.
- **Do** place discarded, damaged, or broken mercury-containing devices and lamps and used mercury absorbent in special mercury collection containers.

DON'T:

- **Don't** place used mercury absorbent material in red bags or regular waste containers.
- **Don't** place discarded, damaged, or broken mercury-containing devices and lamps in red bags or regular waste containers.
- **Don't** pour spilled mercury down the sink.

4. RECYCLING

...is available through several permitted companies in Florida. They accept a wide variety of mercury-containing lamps, devices, chemicals, spill kits, and pourable mercury. Recycling costs depend on the type, amount, and containment of the mercury. If lamps, batteries and devices are recycled in accordance with Florida's Universal Waste Rule, they do not have to be counted toward a facility's hazardous waste generation.

Florida law (Chapter 62-737, F.A.C.) states any mercury-containing device shall not be disposed of in landfills. It also states mercury-containing lights from businesses, including medical facilities, may not be knowingly incinerated. By recycling, the facility can reduce its hazardous waste disposal costs to avoid future liability associated with improper disposal.

Here are some steps you can take:

- Provide separate collection systems for mercury-containing items that are recyclable or reusable.
- Mercury in spill kits can be reclaimed and recycled at some facilities but still must be treated as a hazardous waste.
- Contact your facility's mercury recycler about recycling spilled mercury.
- Recycle all metallic mercury.
- Mercury from many mercury-containing devices and items-including thermometers, sphygmomanometers, switches, gauges, batteries, Maloney and Hurst bougies, Miller Abbot and Canter tubes, and dental amalgam - can be reclaimed.
- If mercury-containing batteries are used, ensure they are being properly collected for disposal. Recycle batteries when possible, or contract with a hazardous waste contractor. In Florida, manufacturers and marketers of mercuric oxide batteries must have a program for proper disposal or recycling of the batteries they sell.

- **Lamp Recycling**

Handle and store fluorescent lamps and HID lamps properly for recycling:

Store lamps in an area and in a way that will keep them from breaking, such as in the boxes they are shipped in.

Mark the lamp storage area with the words “Mercury-containing lamps for recycling.”

Do not crush or intentionally break lamps because mercury may be released.

If lamps are accidentally broken, store them in a sealed container. Pick up any spilled powder with a clean-up kit and dispose of it in the same container.

Take lamps to a consolidation site or recycling facility, if available, or arrange with a transporter to take them to a recycling facility.

To protect the medical facility from future liability, save the invoices that track your lamps and include the date, number of lamps, your hospital’s address, shipping destination with permit number, and transporter name with identification number, and transporter name with identification number (if applicable) on the invoice.

For information on recycling and disposal for mercury containing lamps and other mercury-containing devices, call the Florida Department of Environmental Protection’s toll-free hotline:

1 gram of mercury	Methyl Mercury has been identified as a cause of death in Florida Everglades panthers. Mercury bioaccumulates (increases in concentration in living tissue) as it moves up the food chain. We’re at the top of that food chain, too. Improper disposal of mercury-containing waste can contribute to bioaccumulation in our environment.

5. SUBSTITUTES AND ALTERNATIVES

...are available for many mercury-containing items. The halth and economic benefits of finding and using them are worth the effort.

It may be best to phase out mercury-bearing items gradually. Mercury-free alternatives are available for some existing items without loss of quality. Replacement decreases the need to recycle, saving money and reducing liability.

Some ideas for starting your mercury reduction program:

- Replace mercury-containing thermometers:

Electronic digital thermometers and thermometers filled with alcohol or mineral spirits meet the calibration standards of the National Institute of Standards & Technology. If you must purchase them, mercury thermometers with Teflon or mylar sheaths can help prevent breakage or spills.

Consider including non-mercury thermometers like tympanic or Temp-A-Dot in new baby kits.

- Replace sphygmomanometers with non-mercury units. Wrap the glass tubes of existing mercury units with an easily installed inexpensive mylar coating, available from the manufacturer, to prevent a mercury spill in the case of breakage.

- Replace manometers and other pressure gauges, dials, and switches with digital electronic models. Pressure transducers, filled with high-density liquids other than mercury can substitute for manometers. Alternatives to mercury-containing thermostat switches include electronic, snap action, reed switch, and vapor-filled diaphragm thermostats. These items are accurate, reliable, and inexpensive.

- Solid-state or hard-contact switches can be substituted for some mercury switches. When replacing or installing new switches, look for mercury-free alternatives.

1 gram of mercury	Mercury has the greatest effect on infants, children, the elderly, and the infirm. It can effect nervous system development and cause numerous illnesses.

- Replace mercury-containing batteries.

Alternatives to mercuric oxide and mercury containing button batteries exist. If product performance is not affected, replace them with alkaline, zinc-air, rechargeable nickel-cadmium, or lithium batteries.

Zinc-air batteries can often be used for cardiac telemetry monitors. They may perform better and last longer than mercuric-oxide batteries. Always verify the suitability of zinc-air batteries for cardiac monitors as they are used for emergency care. Zinc-air batteries, which continue to discharge while in storage, may be especially appropriate for continuous monitors. However, they do contain some mercury and may need to be disposed of as hazardous waste.

- Mercury's use in the laboratory can be phased out in many areas such as histological stains and fixatives. Obtain information from vendors and review Material Safety Data Sheets for alternative products. Using some substitutes, such as copper-tin- and chromium-based chemicals, is less of an environmental risk and can reduce disposal costs.

- Require mercury disclosures on all products purchased by the facility, and request the use of recovered mercury in products which do not yet have alternatives.

- Purchasing personnel can leverage their buying power with other hospitals to increase availability of mercury-free alternatives.

- Substitute mercury-containing esophageal dilator tubes with tubes containing water-based or Tungsten compounds.

- Replace conventional fluorescent tubes. T-8 tubes with electronic ballasts contain 20% less mercury than other types.

1 gram of mercury	Mercury enters the atmosphere from natural processes such as volcano eruptions, groundwater seepage, and evaporation from the oceans, but human activity accounts for 50-75% of total releases to the air each year.

MERCURY CONTAINING ITEMS	ALTERNATIVES
B5 Solution Zenker's Solution	Zinc Folmalin, Freeze Drying
Canter Tubes Feeding Tubes Miller Abbot Tubes	Tungsten-weighted tubes
Hematoxylin	Sodium Iodate, Gill's Heatoxylin, Mercury-free Hematoxylin
Lamps	Ordinary Glow Lights, Low Sodium Vapor Tubes, (Yellow) Opticals, High Energy, Long-Lasting Lights
Mercuric Chloride	Magnesium Chloride/Sulfuric Acid, Proclain, Zinc Formalin, Freeze Drying
Mercuric Oxide	Copper Catalyst
Mercuric-Oxide Batteries	Lithium, Zinc-Air, Alkaline Batteries
Mercurochrome	Neosporin, Mycin
Mercury Iodine	Phenate Method
Mercury Switches	Bimetallic Strips, Electronic Strips
Mercury Nitrate	Ammonia/Copper Sulfate, Neosporin, Mycin
Mercury Sulfate	Silver, Nitrate/Potassium/Chromium-(III) Sulfate
Sphygmomanometers	Electronic Vacuum Gauge, Expansion, Aneroid Models
Thermometers	Electronic (Digital), Expansion, Temperature Strips, Tympanic, Gallistan, Red Bulb (Alcohol), Aneroid Models
Thermostats	Electronic Models, Snap Switches
Thimerosal	Proclain, Thimerosal-Free Bactericides

Below is a sample of a peel-and-stick label that can be used on house-keeping carts, sharps containers, red bag containers, or any place where mercury-containing items should not be discarded. They can be ordered from the DEP, or Florida Center for Solid and Hazardous Waste Management.

Additional copies of this publication can be obtained by contacting:

Florida Department of Environmental Protection
2600 Blair Stone Road, MS 4555
Tallahassee, FL 32399
Phone: (850) 488-0300
Fax: (850) 414-0414
E-mail: PRICE_JL@dep.state.fl.us
Web: http://www.dep.state.fl.us

Florida Center for Solid and Hazardous Waste Management
2207-D SW 13th Street
Gainesville, FL 32609
Phone: (352) 392-6264
Fax: (352) 846-0183
E-mail: center@fcshwm.org
Web: http://www.fcshwm.org

This document was published to help educate medical facilities on hazardous waste management issues affecting them. The suggested options may help medical facilities to operate in an environmentally appropriate manner. Some of the options may go beyond what is required to remain in compliance with regulations. Medical facility managers are responsible for obtaining complete information about applicable regulations. Misrepresentations or omissions by the Florida Department of environmental Protection or the Florida Center for Solid and Hazardous Waste Management do not relieve any person from any requirement or federal regulations or Florida law.