



New York State
Department of Environmental Conservation

Pollution Prevention Unit

A Pollution Prevention Guide to Reducing Mercury Emissions From Health Care Facility Incinerators

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INTRODUCTION

Mercury levels are increasing in the environment and are accumulating in fish, wildlife and the sediments from rivers, lakes, and estuaries. A major problem results from the fact that mercury is one of the natural elements that make up our earth's crust. Releases of mercury to the environment can occur naturally or through industrial processes. Natural releases of mercury range from 20 to 50 percent, while human-related emissions of mercury to the air may equal or exceed natural inputs, and range from 50 to 70 percent of the total yearly atmospheric input from all sources. These combined mercury releases cause mercury levels to continually increase throughout our environment.

We cannot begin to reduce naturally occurring releases that result from volcanoes, weathering rocks, forest fires, bogs, forest soils and brown water lakes, but we can reduce the mercury that we release to the environment. The primary sources of mercury that we release to the environment globally are from coal combustion, mining, smelting, industrial use, and waste incineration.

In the Northeast, combustion sources account for over 76 percent of the total inventory of mercury released, and municipal waste combustors account for approximately 50 percent of that amount. Solid waste incinerators account for 38 percent of releases, and sewage sludge incinerators account for 11 percent. Medical waste incinerators are included in the classification of solid waste incinerators and are a known source of releases of mercury to the environment. This occurs as the result of mercury-containing materials from health care facilities that have been placed in infectious waste containers. This guide identifies health care sources of mercury and discusses ways to reduce their release to the environment. Health care facilities may also emit mercury through accidental spills and releases, through discharges to wastewater, and disposal in landfills. The amount of mercury in such releases may be quite small. Still, any release is costly and may add to the buildup of mercury in the environment.

Concerns about the health impacts of mercury are leading to mercury pollution prevention programs at the federal, state and local levels. The highest priority of any pollution prevention program is source reduction, which means not using mercury in the first place. The New York State Department of Environmental Conservation recognizes the need to develop, or support the development of, incentives to encourage pollutant generators to create policies and practices that rely more heavily on source reduction (pollution prevention), rather than on management practices to reduce the release of pollutants after they are generated. Pollution prevention programs are driven by voluntary efforts and by increasingly strict federal and state regulations. Some of the regulations govern occupational exposures and waste disposal; other

regulations result from the Federal Clean Air Act Amendments of 1990. The 1995 Federal Great Lakes Water Quality Guidance (also referred to as the Great Lakes Initiative) sets strict water quality standards for mercury in the eight Great Lakes States.

The recommendations in this guidance document will help minimize or eliminate mercury releases from health care facility incinerators. Although this guide focuses on the elimination of releases from health care facility incinerators, the best practice for health care facilities is to reduce the total use of mercury in their facilities.

SOURCES OF MERCURY IN HEALTH CARE FACILITIES

Instruments and Products That May Contain Mercury

This list is intended to demonstrate the wide variety of instruments and products that may contain mercury. This list should not be assumed to be complete. You should request that vendors disclose mercury contents of all instruments and products used.

Thermometers

- Body temperature thermometers
- Clerget sugar test thermometers
- Heating and cooling system thermometers
- Incubator/water bath thermometers
- Minimum/maximum thermometers
- National Institute of Standards and Technology calibration thermometers
- Tapered bulb (armored) thermometers

Sphygmomanometers

Gastrointestinal tubes

- Cantor tubes
- Esophageal dilators (bougie tubes)
- Feeding tubes
- Miller Abbott tubes

Dental amalgam

Pharmaceutical supplies

- Contact lens solutions and other ophthalmic products containing thimerosal, phenylmercuric acetate or phenylmercuric nitrate
- Diuretics with mersalyl and mercury salts
- Early pregnancy test kits with mercury-containing preservative
- Merbromin/water solution
- Nasal spray with thimerosal, phenylmercuric acetate or phenylmercuric nitrate
- Vaccines with thimerosal (primarily in hemophilus, hepatitis, rabies, tetanus, influenza, diphtheria and pertussis vaccines)

- Cleaners and degreasers with mercury-contaminated caustic soda or chlorine
- Batteries (medical uses)
 - Alarms
 - Blood analyzers
 - Defibrillators
 - Hearing aids
 - Meters
 - Monitors
 - Pacemakers
 - Pumps
 - Scales
 - Telemetry transmitters
 - Ultrasound
 - Ventilators
- Batteries (non-medical uses)
- Lamps
 - Fluorescent
 - Germicidal
 - High-intensity discharge (high pressure sodium, mercury vapor, metal halide)
 - Ultraviolet
- Electrical equipment
 - Tilt switches
 - Air flow/fan limit control
 - Building security systems
 - Chest freezer lids
 - Fire alarm box switches
 - Lap-top computer screen shut-off
 - Pressure control (mounted on bourdon tube or diaphragm)
 - Silent light switches (single-pole and three-way)
 - Temperature control (mounted on bimetal coil or attached to bulb device)
 - Washing machine (power shut off)
 - Float control
 - Septic tanks
 - Sump pumps
 - Thermostats (non-digital)
 - Thermostat probes in electrical equipment
 - Reed relays (low voltage, high precision analytical equipment)
 - Plunger or displacement relays (high current v.s. high voltage applications)
- Thermostat probes in gas appliances (flame sensors, gas safety valves)
- Pressure gauges
 - Barometers
 - Manometers
 - Vacuum gauges

Other

Devices, such as personal computers, that utilize a printed wire board
Blood gas analyzer reference electrode (Radiometer brand)
Cathode-ray oscilloscope
DC watt hour meters (Duncan)
Electron microscope (mercury may be used as a damper)
Flow meters
Generators
Hitachi Chem Analyzer reagent
Lead analyzer electrode (ESA model 3010B)
Sequential Multi-Channel Auto analyzer (SMCA) AU 2000
Vibration meters

Laboratory Chemicals That May Contain Mercury

This list is intended to demonstrate the wide variety of laboratory chemicals that may contain mercury. Some of the chemicals listed below may contain added mercury, and others may contain mercury as a contaminant in a feedstock. If the mercury is a contaminant, its presence or absence may vary from lot to lot. In the case of kits, it is necessary to consider separately each of the reagents that make up the kit.

This list should not be assumed to be complete. You should request that vendors disclose mercury concentrations on a Certificate of Analysis for all chemicals ordered.

Acetic acid	Immu-sal
Ammonium reagent/Stone analysis kit	Liquid substrate concentrates and diluents
Antibody test kits	Negative control kits
Antigens	Phenobarbital reagent
Antiserums	Phenytoin reagent
Buffers	Positive control kits
Calibration kits	Potassium hydroxide
Calibrators	Pregnancy test kits
Chloride	Rabbit serum
Conjugate kits	Shigella bacteria
Diluents	Sodium hypochlorite
Enzyme immunoassay test kits	Stains
Enzyme tracers	Standards
Ethanol	Substance abuse test kits
Extraction enzymes	Sulfuric acid

Fixatives
Hematology reagents
Hormones
Immunoelectrophoresis reagents
Immunofixationphoresis reagents

Thimerosal
Tracer kits
Urine analysis reagents
Wash solutions

BENEFITS OF MERCURY SOURCE REDUCTION

Mercury source reduction in the health care facilities provides many benefits:

1. Protection of human health and wildlife by reducing occupational exposures and releases of mercury to the air, water and land from wastewater discharges, spills, land filling or incineration
2. Minimization of the costs associated with: 1) mercury collection, storage, recycling, or disposal; 2) paper work for tracking hazardous waste disposal; and 3) training for hospital employees who handle mercury-containing products or respond to spills.
3. Avoidance of increased regulation in the future.
4. Increase in community support through public awareness about the dangers of mercury through publicity about the health care facilities waste management practices.
5. Enhanced community image
 - Demonstrates environmental consciousness
 - Mitigates environmental liability and public perception issues
 - Conveys a pro-active process in meeting local or state laws and regulations

RECOMMENDED ACTIONS TO BE TAKEN

In an effort to track reductions in mercury from health care facilities, it is necessary to quantify the mercury that is currently in use. The purpose of this section is to present the elements needed to qualify and quantify the amount of mercury used in a health care facility.

- 1) Health care waste contains up to 50 times more mercury than general municipal solid waste. A program needs to be developed to address the reduction of mercury in Health Care facilities waste. The program should be one of education and source substitution of non-mercury products.
- 2) The use of mercury in products that enter the health care facilities waste stream should be eliminated where feasible, by substitution or by reducing mercury use to the lowest acceptable levels. The battery and light industry is in the process of reducing mercury levels in their products, but it is estimated that it will take until the year 2005 to remove the current inventory of mercury-containing batteries.
- 3) Health care facilities should develop and implement an aggressive, comprehensive education/awareness program to advise staff on ways that they can reduce mercury pollution. This can be done as a process improvement for the Environment of Care section of the Joint Commission on Accreditation of Health Care Organizations standards.
- 4) Health care facilities should promote the collection and recycling of waste batteries, fluorescent lights and other mercury containing equipment
- 5) Mercury bearing wastes should be banned from medical waste incinerators. Recycling of mercury wastes should be promoted.

BEST MANAGEMENT PRACTICES (BMPS) FOR THE MANAGEMENT OF MERCURY WITHIN HEALTH CARE FACILITIES

- 1) Use of alternatives for products that contain mercury.
- 2) Recycling of mercury-containing products when they can no longer be used.
- 3) Correct handling and disposal of mercury, mercury-containing equipment and laboratory chemicals. Proper cleanup of spills involving mercury.
- 4) Development of policies that support BMPs.
- 5) Bar the practice of sending Hg thermometers home with patients.

The BMPs are intended to result in the greatest reduction in mercury discharges to the environment that are currently feasible for health care facilities.

MERCURY-FREE ALTERNATIVES

The following list of alternatives should not be assumed to be complete. These are provided only as examples of mercury-free alternatives that are currently available for use in health care facilities.

Alternatives for Mercury-containing Thermometers

- Electronic (digital)
- Infrared
- Chemical Strip
- Glass filled with gallium, indium or tin

Alternatives for Mercury-containing Sphygmomanometers

- Aneroid
- Electronic

Alternatives for Mercury-containing Gastrointestinal Tubes

- Bougie tubes (tungsten)
- Cantor Tubes (tungsten)
- Miller Abbott tubes (tungsten)
- Feeding tubes (tungsten)

Alternatives for Mercury-containing Laboratory Chemicals

The mercury compound in a chemical formulation may be an active ingredient, a preservative, or a contaminant introduced during manufacturing. Identify why mercury is present and a replacement may be able to be identified. Hospital purchasing agents should contact suppliers and request mercury-free reagents.

Alternatives for Mercury-containing Pharmaceutical Products

In many cases mercury-free preservatives are available. Purchasers should request that suppliers provide mercury-free alternatives whenever possible.

Additional items for which mercury-free alternatives exist

- Batteries
- Electrical Switches
- Pressure Gauges

MERCURY WASTE RECYCLERS IN THE NORTHEAST

Advanced Environmental Recycling Co.
2591 Mitchell Ave.
Allentown, PA 18103
800-554-AERC
Fax:610-797-7696

Global Recycling Technologies
218 Canton St.
Stoughton, MA 02072
781-341-6080
Fax: 781-341-6088

Bethlehem Resources Recovery Division
890 Front St.
P.O. Box Y
Hellertown, PA 18055
610-838-7034

Mercury Refining Company, Inc.
1218 Central Ave.
Albany, NY 12205
800-833-3505
Fax:518-459-2334

Each user is responsible for verifying vendor information. The above list does not imply an endorsement of any company, and is not intended to be all inclusive, but is provided for informational purposes only.

REFERENCES

- 1) "Reducing Mercury Use in Health Care - Promoting a Healthier Environment.'
Prepared by the Monroe County Department of Health, in cooperation with
Strong Memorial Hospital, Rochester, New York and the Monroe County
Department of Environmental Services
- 2) "A New Prescription"
Pollution Prevention Strategies for the Health Care Industry
October 7, 1998, Proceedings - Boston University Corporate Education Center
Tyngsborough, MA
- 3) "An Ounce of Prevention"
Waste Reduction Strategies for Health Care Facilities
1993 American Society for Health Care Environmental Services