Mercury

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This on-line training provides an introduction to mercury issues to the general public and to businesses. It is meant to provide an introduction to the various forms of mercury and their health effects, identify where mercury is found, identify steps to take to reduce mercury use and provide some basic resources to further explore mercury issues.

The mercury on-line training is a compilation of materials from several sources.

Presentation material comes from Mark Durno, U.S. EPA, Greg Stein, Ohio Department of Health, Mike Dalton, Ohio EPA and Bill Narotski, Ohio EPA. It also uses information from Ohio EPA's Developing a Community Mercury Reduction Program (December 2004) available at: http://www.epa.state.oh.us/ocapp/p2/mercury_pbt/Mercury%20Community%20Guide_web.pdf and other sources of information compiled at: http://www.epa.state.oh.us/ocapp/p2/mercury_pbt/mercury.html.

Mercury Presentation Agenda

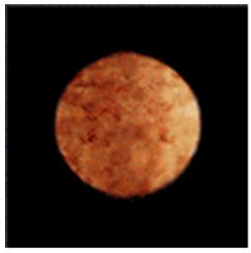
- Why is it a concern?
  - Mercury basics
  - Health effects
  - Where it is found
- Addressing mercury issues
  - Spills
  - Pollution prevention and management of mercury and mercury devices
  - Resources

The training walks you through “Why you should be concerned” i.e. what is mercury, its physical properties and effects on human health, and reviews where you frequently encounter mercury devices.

Then the training discusses how to address mercury issues. Options for addressing spills, managing mercury and mercury-containing item use, and resources available to assist you.

Mercury Presentation Agenda

- Mercury basics



Mercury basics including:

The various physical and chemical forms of mercury, their properties and a brief overview of how mercury gets into the environment.

The images are of the Roman God Mercury (Would be Hermes in Greek mythology), the planet mercury and the mercury space mission.

What is Mercury?

- Element (Hg)
- Heavy metal
- Naturally occurring
- In many consumer products
- Emitted when fossil fuels are burned for energy

Mercury is an element and is naturally occurring. Trace amounts of mercury are found in most plants, animals and soils. Volcanoes and forest fires are natural sources of mercury into the atmosphere.

It is a heavy metal, quite literally (about 104 pounds per gallon in metallic form) with an atomic weight of 200.

It has many practical properties from conducting electricity, expanding evenly with changes in temperature or pressure, being a dense and heavy liquid that flows, and even for its reflectivity. Even its toxic properties have been used as a preservative or a fungicide. These properties make it extremely useful in electronics and other industries, medicine and for household use.

Mercury is a by-product of combustion for energy (as old organic matter is burned, the trapped mercury is then released). Over 40 percent of anthropogenic mercury released into the atmosphere is from the generation of electricity through coal burning utilities. Ohio has many of coal burning for energy production utilities.

It is also used as an electrode in some choloralkali facilities and trace amounts of mercury are found in products that use chlorine from mercury cell chloralkali facilities. Ohio has one of the nine remaining mercury cell chloralkali facilities operating in the United States.

The Common Forms of Mercury

Elemental (also called Metallic Mercury)

- Shiny silver liquid
- Useful properties
- Produces odorless vapors
  http://wbgustream.bgsu.edu/bgsu/epa/index-fl.html
- Forms beads that roll
- Clings to textiles and fabrics
- Apparently irresistible to all ages
- Toxic

Elemental or Metallic Mercury is a shiny, silver, odorless, liquid metal. In its metallic form it is a silvery liquid that looks like it has a chrome-like polish.

At room temperature, metallic mercury will vaporize, forming mercury vapors. Mercury vapors are colorless, do not have a smell and are harmful to your health. The link connects to a Bowling Green State University video clip of mercury vaporizing.

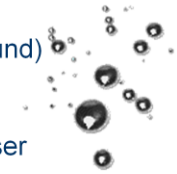
Metallic mercury is toxic, though the greatest concern with it is the inhalation of its vapors. It also can be transformed by bacteria into organic mercury such as methylmercury that more readily bioaccumulates.

Metallic mercury is the common liquid metal used in thermometers, dental fillings, blood pressure cuffs, fluorescent light bulbs, barometers, batteries and auto and home switches.

When spilled, mercury droplets form beads that can roll for long distances. Some of these beads are incredibly small and they can get into cracks, crevices and the weave of fabrics and textiles. It is very hard to get the mercury out of textiles and fabrics.

Units of Mercury- how much mercury is:

- 1000 ng/m3 = 1.0 ug/m3 = 0.001 mg/m3
- 1 pound = 453.6 grams =~ 2 tablespoons mercury =~ 130 thermostats
- 1 pound = a large spill, must be reported
- 1 fluid ounce mercury = 394.4 grams mercury (almost a pound)
- 1 gallon mercury =~ 104 pounds mercury
- 1 gram =~ a bead of mercury about the size of a pencil eraser
- 1 thermometer = 0.5 – 3.0 grams mercury
- 1 thermostat = 3 – 5 grams mercury =~ 75-100 fluorescent lamps worth of mercury
- 1 sphygmomanometer (blood pressure cuff) = 70 – 90 grams mercury



This table helps individuals understand just how much mercury weighs in different volumes.

=~ indicates "is approximately"

Again mercury is very heavy, a gallon weighs over 100 pounds. Most people do not expect it to weigh that much and when they pick up a container their surprise may lead to the container being dropped or mercury spilling.

Air samples measure the amount of mercury in a volume of air, therefore when a spill occurs, it is the mercury concentration in the air that is important. A table on air level recommendations is in the spill portion of the presentation.

So, 2 table spoons is about a pound and the amount of mercury that is a reportable quantity and considered a larger mercury spill.

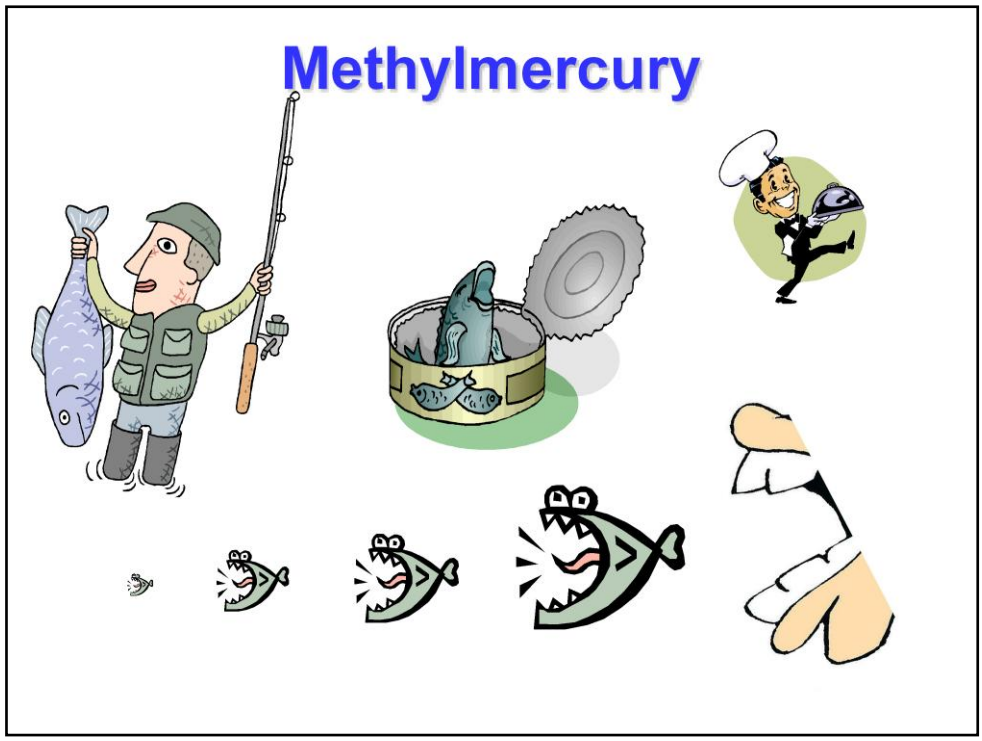
NEMA estimates that the average mercury thermostat has about 3.5 grams of mercury, so it would take about 130 thermostats worth of mercury to equal 1 pound. However, spill responders have found that a single thermostat when broken can raise mercury vapor levels high enough that they are above the safe threshold for air.

A typical mercury fever thermometer has about 0.6 grams of mercury

Forms of Mercury

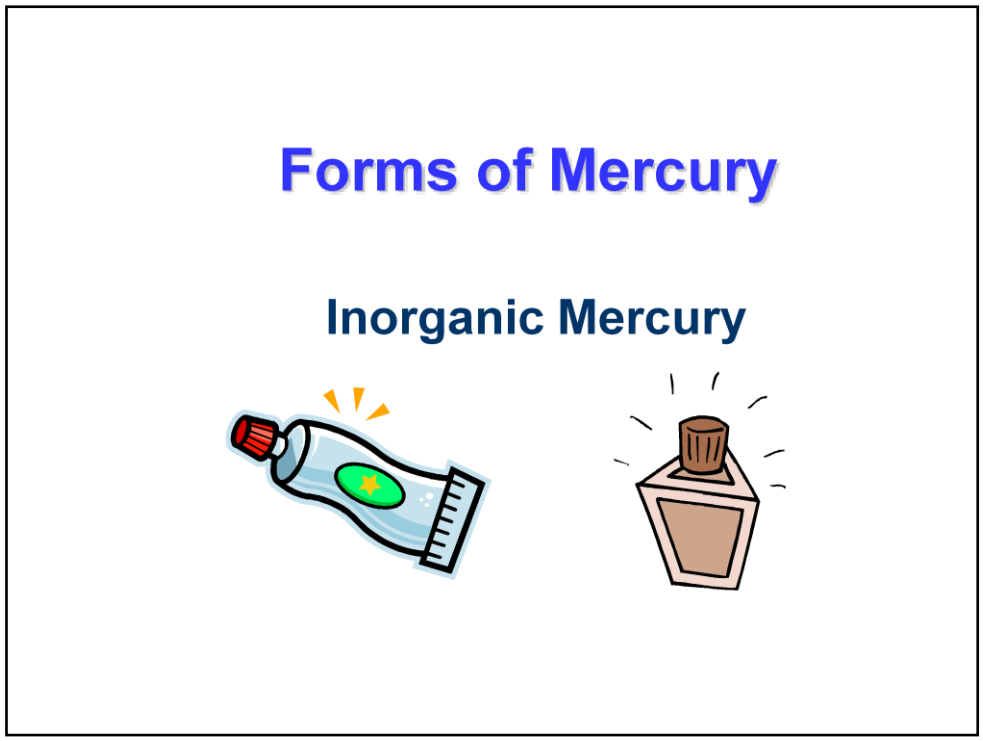
Organic Mercury

Organic Mercury is mercury that is combined with carbon (and hydrogen) to make an organic mercury compound. The most commonly discussed organic mercury compound is methylmercury. Methylmercury is produced by microscopic bacteria that live on the bottom of lakes and ponds. These bacteria transform mercury that is present in the water into methylmercury. Thimerosal is an example of an organic mercury preservative still used in vaccines, including flu shots.



Mercury from the environment is transformed by bacteria into methylmercury and begins its rise in the food chain. Small fish feed on the plankton and pick-up small amounts of mercury, which accumulate in the small fish. The little fish get eaten by larger fish, which accumulate the mercury of their smaller prey, thus adding to their burden. Since these fish eat a lot of smaller fish, they have many times more mercury in them than the smaller fish they eat. In turn, these fish then get eaten by others and so on up the food chain. The top of the lake food chain can have hundreds of thousands of times more mercury concentration than the water column that they are in. Then humans catch these top predators and enjoy an excellent repast. If we eat sport fish that have very high levels of methylmercury in them on a regular basis, we introduce high levels of mercury into our bodies. Over time humans can accumulate levels of mercury in our bodies that can be harmful to us. This can be especially dangerous to expectant mothers and young children with developing neurological systems.

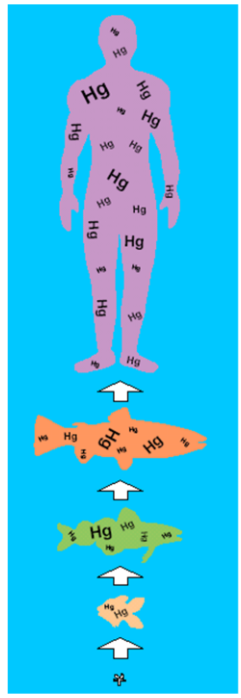
Ohio has sports fish consumption advisories online at the Ohio EPA (http://www.epa.state.oh.us/dsw/fishadvisory/index.html). The fish consumption advisories identify water bodies in Ohio that have fish in them with potentially harmful levels of toxic chemicals. The advisory provides information on how often it is safe to eat fish from these water bodies.



Inorganic Mercury is mercury that combines with other elements such as chlorine, sulfur or oxygen, to form “salts.” Mercury salts were once used in skin lightening creams and may be present in antiseptic creams and ointments.

Mercury is:

- Persistent
- Bioaccumulative
- Toxic
  - ⇨ “PBT”
- Environmental Hazard



Mercury in all its forms is a PBT, I.e., it is persistent, bioaccumulative, and toxic. PBTs receive special status in many environmental regulations because of their ability to build up in the environment and increase in toxicity as they multiply in concentration up the food chain.

How does mercury enter the environment?

Mercury can enter the water or soil from natural ore deposits in rock.

Cinnabar is natural mercury sulfide ore

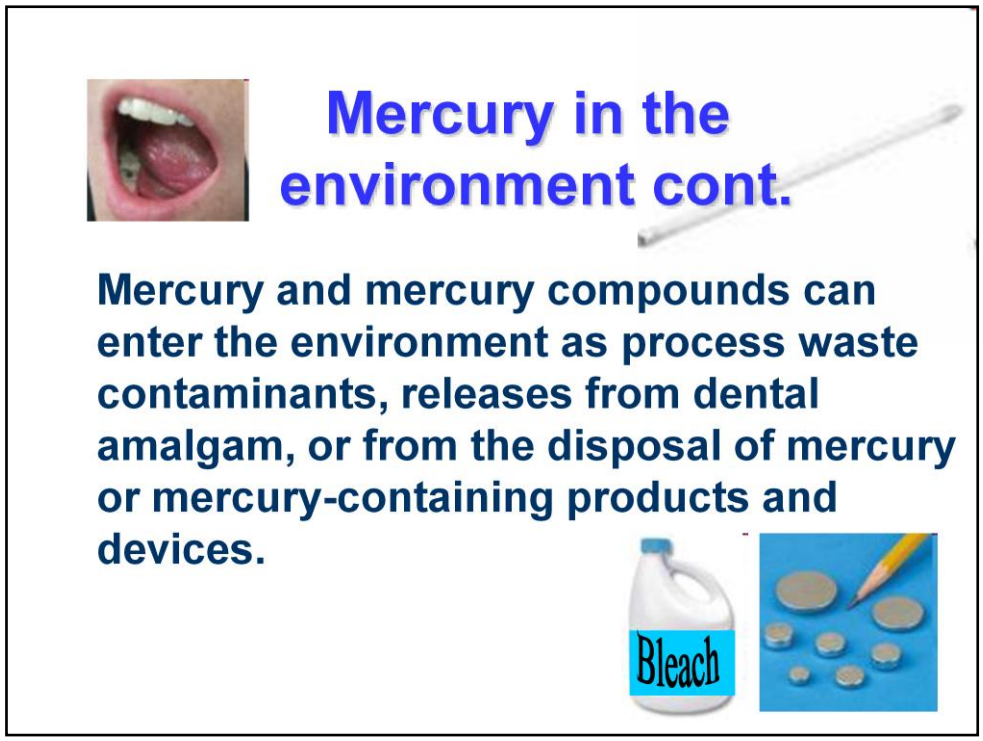
Mercury is an element and is naturally occurring. Trace amounts of mercury are found in most plants, animals and soils, including coal and other fossil fuels. As soil erodes, volcanoes erupt, and forest fires occur, mercury is naturally released into the atmosphere.

Volcanic rock contains higher levels of mercury. One mercury ore is cinnabar and it is common in mercury mines. Almaden Spain has one of the largest mercury mines in the world. Over time the miners in mercury mines started to demonstrate the symptoms of mercury poisoning. In the middle ages, the average life spans of slaves used to mine mercury, once they entered the mines, were from 6 months to 3 years.

Mercury in the environment cont.

Metallic mercury and inorganic mercury compounds can enter the air from burning coal and the coal mining waste.

When mercury is released by the burning of coal, it will come down in the rain that will then run into Ohio's lakes and streams. This mercury in turn can be transformed by bacteria into methylmercury and enters the food chain. The combustion of coal is the major human caused release of mercury into the environment with over 40 percent of all human released mercury coming from the combustion of coal for energy.



Mercury can also enter the environment as a release from manufacturing processes, as a trace impurity in products such as bleach, or when mercury-containing products such as most button cell batteries, are thrown away.

Dental amalgam has several opportunities to become a contributor to environmental issues. At the dental office, some amalgam and mercury is released down the drain. Through the life of the filling some mercury will escape and be part of a household's wastewater releases and at an individual's end of life, if the individual is cremated, mercury from fillings is emitted into the air. In fact mercury from dental offices is the largest point source of mercury to many waste water treatment plants in small or medium sized cities.

Mercury Presentation Agenda

- Health Effects

Health effects will be reviewed next, including how mercury gets into the body and what are the toxic effects of mercury.

How does mercury get in your body?

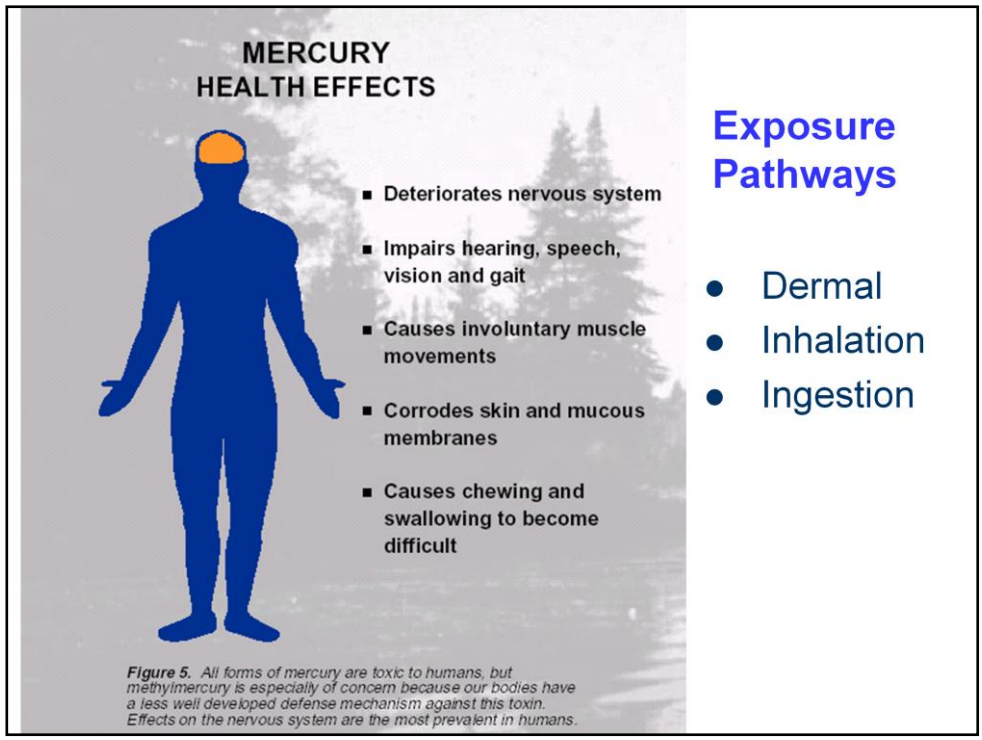
- By breathing the vapors in the air from a mercury spill.
- By breathing the smoke, vapors and particles from industries that burn mercury-containing coal.
- By breathing contaminated workplace air or skin contact.

Elemental mercury volatizes into vapor that can be breathed in. The vapor is quickly absorbed through the lungs. If you drop a mercury thermometer on the ground and it breaks, mercury will separate into many small beads and can roll a large distance away from the location of the break. At room temperature, metallic mercury will vaporize. The higher the temperature, the more vapors will be released. These vapors are colorless, odorless and are harmful to your health.

How does mercury get in your body (cont.)?

- By eating fish or shellfish contaminated with methylmercury.
- By the small releases of mercury from dental work and medical treatments.
- There is an increased risk for dental, health services, chemical and other industries that use mercury.

Methylmercury is a major source of exposure to the general population. Individuals who work in businesses that handle mercury regularly have an increased risk of mercury exposure. Ohio Department of Health is currently (2005) working with the Ohio Dental Association to begin to address the use of mercury in dental procedures concern. The Ohio EPA has been working with dental offices and the Ohio Dental Association for many years on mercury issues.



As you have seen, individuals can become exposed to mercury through several pathways, including touching mercury, breathing it in or eating it.

Routes of Exposure

	Oral	Inhalation	Dermal
Elemental	low	high	low
Inorganic	high	low	moderate
Organic	high	low	high

This table points out the issues with each form that mercury is in. Elemental/metallic mercury enters the body most efficiently through inhalation. Inorganic mercury salts are most efficient entering the body through ingestion though skin contact is also an issue. Organic mercury enters the body most efficiently through ingestion, e.g. methylmercury in fish, or dermally. For example dimethyl mercury is acutely toxic and can be fatal even with a small quantity through skin contact/dermal exposure.

Who is most susceptible?

- Children
- Women of childbearing age
- Fetuses

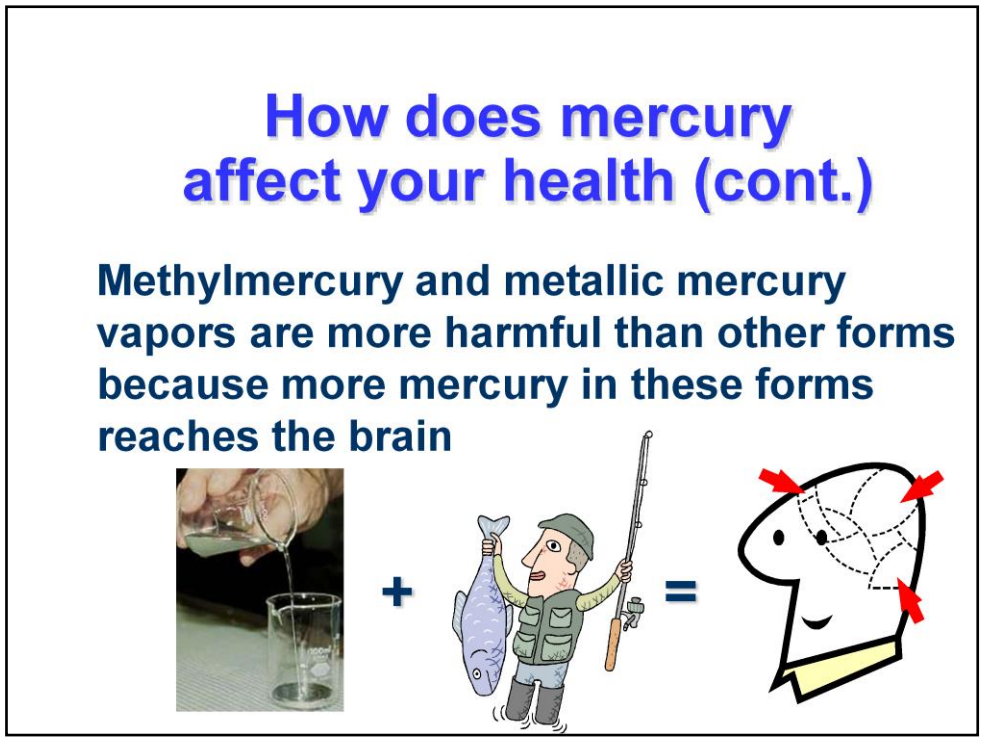
Some populations are more susceptible to mercury toxicity than others. Children, fetuses and women of childbearing age are the most susceptible to all forms of mercury. Mercury accumulates and may stay in a mother-to-be's body, when a woman becomes pregnant the mercury can pass and even be concentrated as it passes to the new fetus. Mercury is a neurotoxin and effects the developing nervous system which can lead to lifetime learning disabilities in children. Small children also do not have a large amount of body mass, so less of a toxin can have an effect on them that it would not on a full grown adult.

Some individuals may also be more sensitive to mercury, just like some people are more sensitive to certain allergens.

How does mercury affect your health?

- Mercury is a potent acute neurotoxin that affects many organs (e.g. kidney, liver)
- The nervous system is very sensitive to all forms of mercury

Mercury is a potent acute neurotoxin that affects many organs (e.g. kidney, liver). The nervous system is very sensitive to all forms of mercury.



Methylmercury and metallic mercury vapors are more harmful than other forms because more mercury in these forms reaches the brain.

How does mercury affect your health (cont.)

Exposure to high levels of metallic, organic or inorganic mercury can permanently damage the brain, kidneys or a developing fetus.

Learning disabilities and birth defects

- 630,000 U.S. Children at Risk (U.S. EPA, 2004).
- 1 in 6 women of childbearing age have elevated mercury levels (U.S. EPA, 2004).

U.S. EPA estimates that as many as 630,000 children are at risk of having potentially damaging levels of mercury. Much of this value is attributed to the blood mercury levels of women of childbearing age. In 2004, U.S. EPA also estimated about 1 in 6 women could be at risk for high levels of mercury. Mercury damage to children can be permanent.

How does mercury affect your health (cont.)

Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing and memory problems.

Mercury is a neurotoxin, so the toxic impacts effect the nervous system.

In the late 1800's hat makers, or hatters, used to use mercury nitrate when working with beaver fur to make felt. Over time, the hatters started exhibiting apparent changes in personality and also experienced tremors or shaking. Mercury poisoning attacks the nervous system, causing drooling, hair loss, uncontrollable muscle twitching, a lurching gait, and difficulties in talking and thinking clearly. Stumbling about in a confused state with slurred speech and trembling hands, affected hatters were sometimes mistaken for drunks. The ailment became known as "The Danbury Shakes" in the community of Danbury where hat making was a major industry. In very severe cases, they experienced hallucinations. The term "mad as a hatter" may be a product of mercury toxicity. The practice did not completely stop until 1943.

How does mercury affect your health (cont.)

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes and eye irritation.

Mercury causes many health problems. It is important to make schools, business and the general public aware of the dangers of mercury and give them the tools to avoid these dangers. It may be difficult to identify early mercury poisoning, because many of its early symptoms are similar to a cold or flu. However, doctor's may also recognize the signs of heavy metal poisoning. In advance stages of mercury toxicity it is possible for the skin to start flaking off. This is called Pink's disease or acrodynia.

Those who exhibit toxic symptoms of mercury may have been introduced to mercury vapors at work, or vapors from a spill at home over time or regularly eat fish that are high in mercury. The Ohio Sport Fish Consumption Advisory is located at: http://www.epa.state.oh.us/dsw/fishadvisory/index.html. The U.S. Food and Drug Administration also maintains a list of fish and shellfish by their mercury levels, http://www.cfsan.fda.gov/~frf/sea-mehg.html. The fish with the highest levels are tilefish, swordfish, king mackerel and shark. Premium tuna can have high mercury levels. It also can be a concern because many individuals eat large quantities of tuna as part of a "healthier" diet and any mercury from the tuna can bioaccumulate.

Case Study: Lincoln Park Site

- Smelting operation in basement of home.
  - Recovering silver from dental amalgam.
  - Next to furnace.
- Four adults hospitalized and died.
- House decontamination failed.
  - Recovered 78 pounds from vapor recovery system.
  - Spent over $200,000.
  - County demolished house.

In Lincoln park (Detroit) Michigan, in 1989, a resident living with 3 housemates was heating scrap dental amalgam to extract the silver. The extraction process was done next to the furnace. The mercury vapors were presumed to have filled the house at least partially because of how close he was to the furnace. All four of the residents were hospitalized and then all four died. The U.S. EPA attempted to decontaminate the house, but was not able to bring the mercury levels down to a safe level even after recovering 78 pounds of mercury from the house's atmosphere and spending over $200,000. Eventually the house was demolished and sent to a hazardous waste landfill.

Is there a test to show if you have been exposed to mercury?

Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury.

Ohio Department of Health identifies two tests that can measure mercury levels in the body. For exposures greater than a few days, a urine test is recommended.

Mercury Exposure
Human Health Effects

- Nausea
- Shortness of breath
- Bronchitis
- Migraine headaches
- Fatigue
- Nervous system, kidney and liver damage
- Shakiness and tremors
- Gum problems
- Numbness in fingers and toes
- Loss of muscle control
- Memory loss
- Kidney disease and failure
- Baldness

- **Learning disabilities and birth defects**
- 630,000 U.S. Children at Risk (U.S. EPA, 2004)
- 1 in 12 women of childbearing age have elevated mercury levels (U.S. EPA, 2003)

Again all of these have been identified as symptoms of mercury poisoning. The most far reaching effect though is the potential disabilities and birth defects from mercury poisoning.

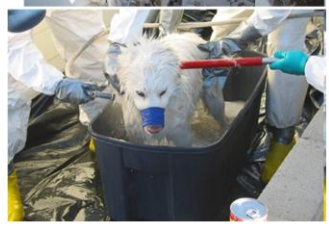
Has the federal government made recommendations to protect human health?

- The EPA has set a limit of mercury in drinking water at 2 parts per billion (2 *ppb*).
- The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 *ppm*).
- The Occupational Safety and Health Administration (OSHA) has set limits of 100 µg/m3 (microgram per cubic meter) of organic mercury per cubic meter of workplace air and 50 µg/m3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.
- The Agency for Toxic Substances and Disease Registry (ATSDR) has set a guideline of ≤1 µg/m3 (microgram per cubic meter) as the acceptable level for most residential occupancy, provided no visible metallic mercury is present.

Some of the safety recommendations made regarding mercury.

Case Study:
Playing with mercury is a gamble

- January 2004, Las Vegas, Nevada
- 17 year old male
- 1 quart of mercury found
- Hospitalized in intensive care for a week, neurological damage may be permanent
- Family's possessions disposed, backyard and pool demolished
- Snowball (dog) contaminated
- Cost of clean-up and replacement approaching $500,000



This case study demonstrates these points very well.

The 17 year old found a quart of mercury and spilled it throughout the house, backyard and pool. The man was hospitalized to treat his symptoms of mercury poisoning. The back yard, pool and house required remediation. The dog, Snowball, was also contaminated and need treatment which included shearing. The cost of the response was over $140,000. However the cost to replace all the materials that could not be recovered brought the cost of the spill recovery to nearly $500,000.

Mercury Presentation Agenda

- Where is it found

Continuing the training with a review of the common and some of the less expected places where mercury may be found.

You are all familiar with where mercury can be found, so there are few things that would surprise you. Right?

In Chicago in 2000 there was city wide concern when the natural gas meters were being maintained and calibrated and the workers were not being careful. The gas company contacted 300,000 homes and inspected them to see if any mercury had spilled. About 150 spills were found and cleaned up.

Mercury also can be found in thermometers, button cell batteries, toys, carpentry equipment such as this starrett, grandfather clock pendulums, old mirrors and paintings, fishing lures, bow and gun recoil stabilizers, telescopes, golf balls, jewelry, art work, and in dental fillings. Other uses of mercury will appear later. Mercury has had and still has many uses.

More uses of mercury include blood pressure gauges (sphygmomanometers), thermostats, mercury relay switches, motorcycle carborator kit, mercury fountains, bulk mercury, a lighthouse where the lens floats in a pool of mercury, and a giant telescopes reflective surface using a spinning plate filled with mercury to form the mirror.

Where is mercury use appropriate

- Mercury is a very useful element
- There are locations where mercury use is appropriate
- E.g. fluorescent lamps

Mercury Probe, 2004

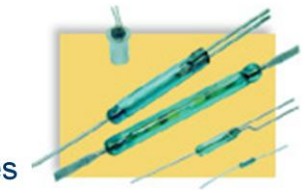
Mercury does have viable uses, even some in the home. The most common example is in fluorescent lamps. In fact fluorescent lamps are very efficient and help reduce the overall emissions of mercury to the environment by reducing the amount of energy businesses and households use.

Locations where mercury-containing items are often unnecessary

In most buildings, especially schools, residential homes and apartments mercury may not be necessary or appropriate for anything other than fluorescent lamps and in button cell batteries.

Where is mercury found?

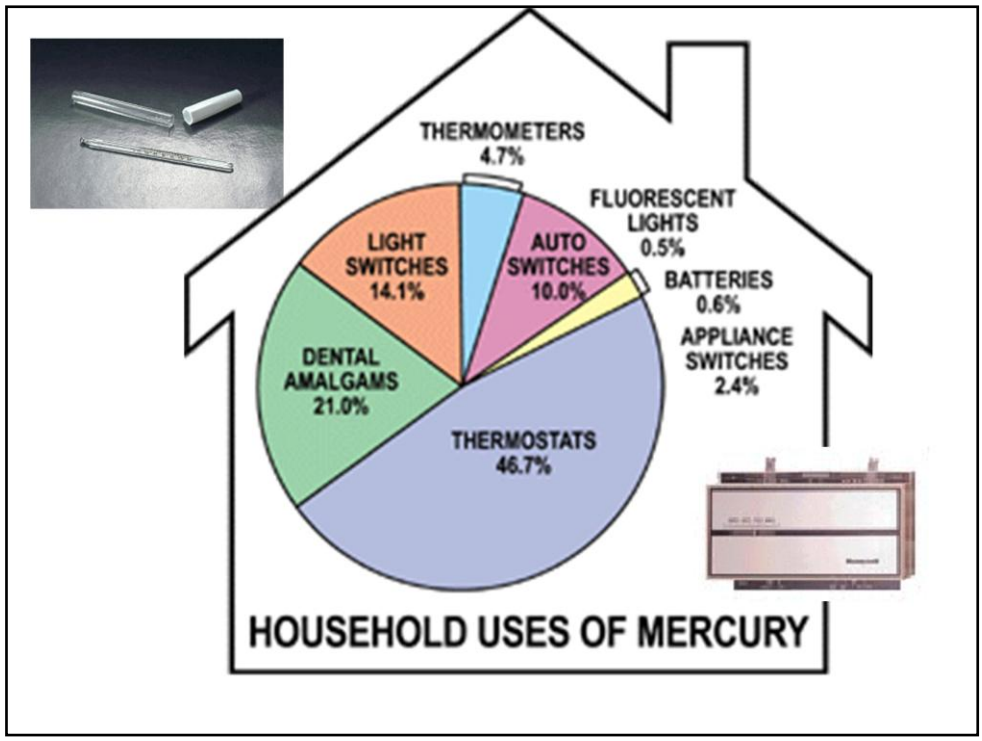
- Industrial relay switches
- Thermostats
- Thermometers
- Barometers
- Manometers/pressure gauges
- Fluorescent lamps
- Button cell batteries
- Silent wall switches
- Old latex paints and old pesticides



Mercury is often found in industrial relay switches, thermostats/accustats, thermometers, barometers, manometers, fluorescent lamps and button cell batteries. Mercury is also found in old silent wall switches, latex paints (fungicide) and in old pesticides. Many chemical products may have mercury in them and these are outlined in the Mercury Challenge Guide and Community Mercury Guide. There are also a variety of other locations including novelty items that may have mercury in them as discussed on previous slides.

An excellent tool to find information on mercury containing items is the Interstate Mercury Education & Reduction Clearinghouse (IMERC)

Mercury-Added Products Database located at: http://www.newmoa.org/prevention/mercury/imerc/notification/.



As you can see here, thermostats are the largest household source of mercury, after that dental amalgam (in the occupant's teeth) is the next largest source of mercury.

The Mercury Thermostat

- They're everywhere
- ~ 7-8 million sold annually
- Low income housing
- Schools
- Inexpensive alternatives
- More efficient alternatives
- Many states have sales bans, including Ohio

The mercury thermostat is the largest mercury source in a typical household and is very widespread. The industry estimates that 90 percent of thermostats currently in circulation contain mercury. And 7-8 million are currently (2004) sold annually. These thermostats are often used in low income housing and apartments. They also can be found in schools and are potential sources of mercury spills in schools. There are low cost alternatives readily available and some of the alternatives, namely electronic programmable thermostats, can greatly improve a houses energy efficiency. Already 7 (California, Connecticut, Illinois, Maine, Oregon, Washington, Wisconsin for residential use) states have banned the sale of residential mercury thermostats (Illinois and Maine's state laws included all mercury relay switches which would include thermostats).

Where is mercury located in Schools and Laboratories:

- Bulk elemental mercury
- Mercury in compounds
- Thermometers
- Chemistry and Physics gauges and manometers
- Plumbing

Laboratories have a variety of measuring devices that may contain mercury, but they may also have bulk elemental mercury, or compounds that contain mercury. Mercury may be found in the plumbing of laboratories. Schools in particular may have plumbing issues because some students may not have followed proper chemical disposal procedures. Over time mercury can remain trapped and/or accumulate in plumbing, so that there could be a spill if any work is done on the plumbing.

Other mercury containing products

- Blood pressure cuff gauge (sphygmomanometer)
- Contact lens solutions
- Vehicles
- Dental amalgam
- Religious products
- Novelties

Some blood pressure gauges (sphygmomanometers) also contain mercury. The mobile gauges must be handled carefully because they are more likely to be broken than the wall mounted gauges. They may contain several ounces of mercury and create a challenging spill to clean up.

Old contact lens solutions also had mercury in them.

Vehicles may have mercury in several locations, including in switches for the hood's or trunk's convenience lighting, part of the ABS breaking system, in the dashboard display and in headlights of some vehicles. European and Japanese made car manufacturers have removed much of the mercury from vehicles.

Dental amalgam and novelty items as previously mentioned also are sources of mercury.

Some novelty items use button cell batteries (almost all button cell batteries have mercury in them) that have higher than average mercury content.

Certain Latino and Afro-Caribbean traditions may use mercury. These traditions include Santeria, Palo, Voodoo, and Espiritismo. Religious

Mercury Presentation Agenda

- Spills

Ohio EPA Spill Hotline: 1-800-282-9378

The spills and spill response section of the presentation is compiled from various training workshops lead by Mark Durno, U.S. EPA and Mike Dalton, Ohio EPA. The Ohio EPA Spill Hotline number is 1-800-282-9378, and is the first call you should make when you have spilled mercury and wish for help or have a reportable mercury spill.

One thing that is important to recognize is that when a spill occurs the focus shifts away from protecting the environment to protecting human health first. Many of the activities that ventilate spill areas, ventilate the mercury to the ambient environment, in order to more rapidly bring the human occupation areas down to safe levels. The best way to reduce this is by reducing the number of mercury spills that occur, which means reducing the use of mercury containing products.

Never use a vacuum cleaner on a mercury spill. Period. Using a vacuum cleaner on a mercury spill, volatizes the mercury and spreads it in a much greater area than the original spill. This can cause even small amounts of mercury to reach dangerous air concentrations. Once a vacuum cleaner has been used to pick up mercury, it becomes hazardous waste and needs to be handled and disposed as such.

Spill Response

- First actions
- Do spills have to be reported?
- Who is in charge?
- Who is responsible?
- General Removal Guidelines
- Risk-based Clean-up Criteria: How clean is clean?
- How is it done?
- How much will it cost? - Case Studies

These are the topics covered in the spill response section.

Responding to a mercury spill can be expensive. Examples of the cost of clean-up will be found in the case studies.

What to do if you have a spill: Initial actions

- Get people out of the area, don't step in the spill
- If mercury came in contact with clothing and shoes, remove the items, place them in a plastic bag and seal the bag. Place bag outdoors in secure location
- Wash any areas that mercury came in contact with immediately with soap and warm water
- Turn off HVAC to the area and open windows to the outside if possible
- Place towels or other materials at the bottom of the door into the area to prevent vapor migration, if possible
- Determine if you need a professional spill clean-up - Call the Ohio EPA spill hotline at (800) 282-9378, local health department, and others as appropriate or to get information on spill clean-up and determine if you need an official response

The information is from U.S. EPA's Ohio Mercury Outreach and Training Manual.

The local health department, local poison control center and Ohio EPA spill responders can also walk you through how to clean up a small mercury spill yourself and help you determine whether or not you should hire a contractor.

Never use a vacuum cleaner on a mercury spill. Period. Using a vacuum cleaner on a mercury spill, volatizes the mercury and spreads it in a much greater area than the original spill.. Once a vacuum cleaner has been used to pick up mercury, it becomes hazardous waste and needs to be handled and disposed as such.

Do spills have to be reported?

- Maybe…
- It depends on where it happened and how much was spilled
- Outdoor spills are reportable when they exceed one pound
- Indoors it depends on if it is a home, school, or business

Mercury spills over 1 pound MUST be reported if they are outdoors or in a business. If sensitive populations live, play or attend areas where a spill occurs, it may also be worth contacting the Ohio EPA or a professional contractor to make sure the area is safe for those using the area. Even smaller spills can raise the mercury level in the air above the recommended safe level.

Professional clean-up may be necessary when:

- Sensitive populations use the area
- It is a high risk situation: mercury spilled by a heat source, air duct, or indoor drain
- Was mercury spilled on a porous surface that cannot be easily removed by you
- You do not feel comfortable cleaning up the mercury spill yourself

Even if you don't have to report a spill, there are times that you should hire a spill clean-up contractor If sensitive populations live, play or attend areas where a spill occurs, it may also be worth contacting the Ohio EPA or a professional contractor to make sure the area is safe for those using the area. Even smaller spills can raise the mercury level in the air above the recommended safe level. Many times when an untrained individual tries to clean up a mercury spill, the clean-up is not complete and the mercury vapors in the air may continue to be above the recommended "safe" levels. The Ohio EPA can help by providing advice and guidance on how to choose a spill clean-up contractor. If mercury was spilled near heating and ventilation system the constant airflow over the mercury can increase its rate of vaporizing and raise the mercury to unsafe levels in the air. It is important to clean-up the mercury spill as well and if you can not remove a porous surface for disposal you should consider using a contractor to clean the area. Sometimes you simply do not feel comfortable doing the clean-up yourself. Personal or business liability may also drive a decision to hire a professional contractor, to ensure that everything possible was done to clean-up a spill.

Who do you report spills to?

- Local or County Health Department
- Local Fire Department
- Ohio EPA 800-282-9378
- National Response Center (U. S. EPA & Coast Guard) 800-424-8802

When you have a mercury spill larger than a thermometer, you should contact your local or county health department or your local fire department for information on what to do about the spill. For larger spills, or large spills that are outside, contact the Ohio EPA spill hotline or the National Response Center.

Who is in charge?

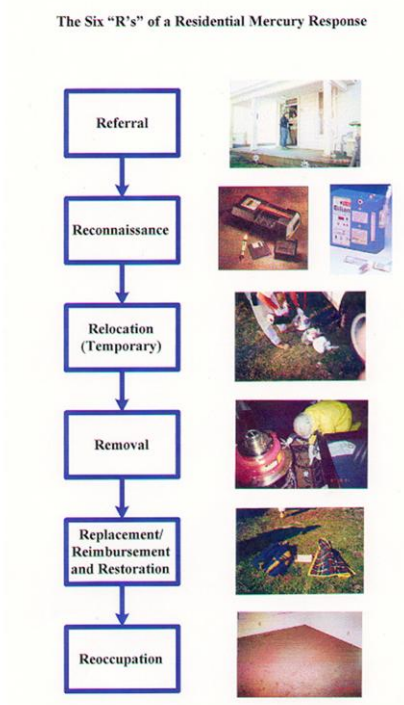
- Outdoors = U. S. or Ohio EPA
- Schools = Health Department
- Homes = Health Department
- Business = OSHA

When a spill does occur, different agencies are in charge of leading the clean-up response.

Who is responsible?

- Outdoors: the owner of the mercury
- Schools: the school board
- Homes: the homeowner
- Business: the business owner or the landlord

Similarly, depending on the situation different people may be responsible for paying for a spill clean-up.



U.S. EPA has developed a flow diagram of mercury response.

1. First someone reports the spill, referring it to a qualified spill responder. The spill responder gets as much information as possible about the spill.
2. The spill responder uses an air meter to sample the air and determine the level of protection necessary for a clean-up. The meter is used along with a visual inspection to confirm and fully identify the location of the mercury spill.
3. The inhabitants of the residence are relocated while the clean-up is occurring, This is done so that they do not walk through the spill or otherwise spread it.
4. The appropriate person to clean-up the spill comes in and carefully removes all the mercury and mercury contaminated materials.
5. After the clean-up and follow-up air sampling, the residence can be restored to an inhabitable state. Note, this does not mean that couches and removed furniture or carpeting will be returned, it only means that the house will be made so that it is livable.
6. The residents may reoccupy their home. As previously mentioned they may have to purchase new carpeting, furniture, etc.

General Removal Guidelines

- Identify contaminated areas
- Collect visible mercury
- Assess and/or remove porous items
- Treatment of porous items
- Assessment of appliances
- Decontamination of non-porous items
- Ventilate impacted areas
- Re-screen and re-assess
- Stabilization and sampling

Cleaning up a mercury spill can be a very tedious process.

Risk-Based Clean-up Criteria

Indoor Air Concentration (ug/m^3)	Use of Action Level	Method of Analysis
≤ 1	Residential occupancy level	NIOSH 6009 or equivalent
10	Immediate evacuation	Real-time air monitoring
10	Acceptable level for return of personal belongings	Real-time air monitoring
3	Commercial setting where mercury is not handled	NIOSH 6009 or equivalent
25 / 50 / 100 / 1000	TLV / REL / PEL / IDLH	Real-time air monitoring

* Risk based number have changed often.

The numbers provided here are recommendations from ATSDR and other organizations. They are the values typically used to determine if an area is safe for occupancy or rehabilitation by U.S. EPA, Ohio EPA and local health departments. An air sampling meter designed to monitor for mercury levels is used to determine how much mercury is in the air at the breathable level. In a residence or school, multiple levels may be checked to correspond to adults and children. The thresholds are migrograms of mercury/cubic meter. Schools and residences are deemed safe at 1 ug/m3. Commercial settings, where handling mercury is not part of the business, have a higher acceptable threshold at 3 ug/m3. If mercury is regularly handled in the business it follows different rules and must meet OSHA standards.

Removal Specifics

The next slides go over the mercury removal process and are meant to provide an understanding of what a mercury spill clean-up entails.

Identify Contaminated Areas

*Interview all involved parties prior to entry.

Visual Identification

Air Screening

When a spill responder goes to a mercury spill site she first interviews everyone involved in the spill, so that they better understand the nature of the spill and what to expect. They then use two primary methods to find areas of concern and determine the extent of the spill.

The first is through air screening or air monitoring using a mercury vapor analyzer. These machines take in air, analyze it and provide a readout of the mercury concentration is in the area. The measurement is micrograms of mercury in a cubic meter of air and the thresholds for action are listed on the previous table. Responders typically will start monitoring before they enter a house or building. High levels require the responders to use personal protective equipment including air filter masks or even more protective equipment.

The second method to identifying a contaminated area is sight identification. It is easy to see large pools of mercury. When mercury is spilled it can breakup into many tiny beads that can scatter and roll quite a distance creating a large spill area. Therefore a powerful flashlight is used to see the reflection of the mercury droplets. For spill response magnifying glasses are also used to identify where beads have gone. However, the air monitoring equipment is extremely sensitive and can find even very small mercury beads through the vapor that they generate.

Collect Visible Mercury

Mercury Spill Kit

Alternative Methods

-Pipette

-Duct Tape

-Shaving Cream

-Paper Cones

For spill clean-up there are different methods to collect the visible mercury. After using a powerful flashlight and being careful not to be IN the mercury spill, a spill responder begins the long and difficult task of collecting the visible mercury. Not all mercury spill kits are effective and it is important to do your research carefully. Spill responders often use pipettes, duct tape and other tools to pick up beads of mercury. There are many, many, beads in a typical spill, so responders may make a grid to carefully go over every square inch looking for and collecting mercury beads.

Collect Visible Mercury

Mercury Vacuum

Home owners and businesses should never use their vacuum cleaner, even one with HEPA filters, to cleanup a mercury spill. Using a vacuum cleaner, that is not specifically designed to collect mercury, on a mercury spill volatizes the mercury and spreads vapors through-out the area. This can cause even small amounts of mercury to reach dangerous air concentrations. Once a vacuum cleaner has been used to pick up mercury, it becomes hazardous waste and needs to be handled and disposed as such.

Once all the large quantities of mercury have been collected physically, a mercury vacuum can be used to further remove the remaining spilled mercury.

The mercury vacuum is a special vacuum with many levels of filters designed specifically to pick up mercury and reduce air emissions. When using a mercury vacuum, responders will establish a grid or a tracking mechanism and thoroughly clean each square in the grid before moving on to the next square. It is a very tedious process and must be done slowly and carefully.

After thoroughly cleaning the spill a vapor suppression solution, a special chemical wash, is used to help reduce any mercury vaporization and rinsed. After that it is still important to air out the area to the outside.

Assess and/or Remove Porous Items

- Evaluate large impacted porous items.
  - Carpet, mattresses, furniture,wood molding, concrete.
  - Substantial increases above ambient conditions warrants treatment or removal.
- Evaluate small impacted porous items.
  - Place in plastic bags.
  - Remove from structure.
  - Screen and evaluate (10 ug/m^3).

Often times mercury can cling and permeate porous items, these items are tested to see if they are contaminated and if so decontamination begins. For some items decontamination is not economically feasible and they are disposed as hazardous waste.

Treatment of Porous Items

- Carpet and Mattresses.
  - Remove if concentration is substantially above ambient
- Molding, Tile, Concrete, Drywall, Furniture
  - Attempt to decontaminate (vacuum and decon solution)
  - Heat and vent treatment
  - Seal (last resort)
- Personal Belongings (clothing, shoes, linens, etc.)
  - Ventilate outdoor (ideally, in warm climate)
  - Bag and screen
  - If above 10 ug/m3, dispose
  - If below 10 ug/m3, re-ventilate and return

Examples of porous items and how they are treated. Some areas such as concrete floors may still give off vapors after a thorough cleaning. As a last resort the concrete is sealed so that the mercury can no longer escape into the room. After other belongings are decontaminated, often by heating the items with a lot of ventilation outside, the items are monitored. If after continued heating and ventilation the items cannot be brought below the safe threshold they are disposed as hazardous waste.

Assessment of Appliances

- Washer and Dryer
  - Screen
  - Remove and ventilate any clothing
  - If less than 10 ug/m^3, run empty cycles

Appliances also need to be inspected. Sometimes people try to clean their own contaminated clothing and contaminate the appliances. This contaminates the washer and dryer, requiring them and their contents to also go through decontamination.

Decontamination of Non-Porous Items

- Wash impacted areas/items with mercury vapor suppression solution
  - Sulfur-based compounds are corrosive
  - Allow for appropriate reaction time
- Clean water wipe down
- Re-screen

Non-porous items are easier to clean than porous.

Ventilation of Impacted Areas

- Isolate non-impacted areas
  - Screening indicates no mercury concentrations in air
- Set up cross ventilation in impacted areas
  - High volume fans, box fans, etc
  - Vent in from non-impacted areas
- Allow to ventilate for approximately 24 hours at increased temperature

Ventilation is necessary to clear out mercury vapors in contaminated areas. Often high volume fans are brought in to evacuate the mercury contaminated air.

Re-screen and Re-assess

- Screen both impacted and non-impacted areas
- If screening is above action level, a source likely exists in the structure
  - Use low-level intensive screening techniques to identify source areas
  - Decontaminate or remove identified source
  - Repeat ventilation
- If screening is just below the action level, consider heat/vent techniques
- If screening is well below the action level, stabilize conditions and sample

After the clean-up is done, more air sampling is conducted to insure that the air levels are below the action level. The area can be designated as being below the clean-up threshold and useable or in need of more clean-up.

Stabilization and Sampling

- Stabilization Conditions
  - Seal off impacted areas
  - Raise to room temperature
  - Allow conditions to equilibrate over 4 to 8 hours
- Sampling
  - NIOSH Method 6009 or equivalent (8 hour)
  - Collect from breathing zone from impacted areas

Stabilization after clean-up is used to bring the area back to its normal environment when the area is used. Air sampling is performed to ensure the mercury vapor readings are below the threshold level.

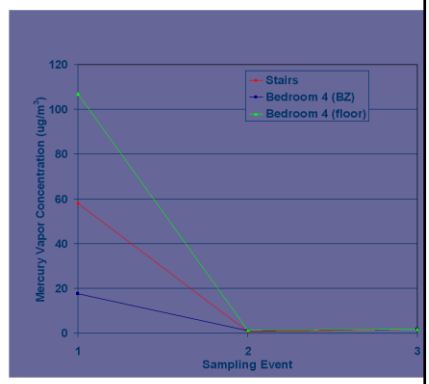
Case Studies

- Designed to show the differences on various clean-ups
  - Notification
  - Extent of contamination
  - Tracking
  - Clean-up techniques
  - Difficulties encountered
  - Costs

The following case studies describe various aspects of what to expect from a mercury spill.

Case Study: Centreville Mercury Spill

- Mercury spill identified by doctor assessing sick child
- Foster home
- No visible mercury evident
- Screening and sampling used to identify likely source area
  - Levels > 100 ug/m^3.
- After removing all items from impacted room, level drop to less than 2 ug/m^3
- Used "old" screening techniques
- Clean-up cost: $ 30,000



In aroom in a foster home, the concentration of mercury vapor was very high, but the source of the mercury could not be found. After the room was cleared of all the furniture and possessions, the mercury levels dropped greatly. Once an are has been decontaminated and the contaminated materials are disposed, it is up to the home or business to refurnish the area. The cost of new furniture and carpeting are not included in the clean-up cost.

Case Study:
Lorain County Mercury Spill

- Potentially tracked to 48 homes, 8 schools, and 5 school vehicles
- One house, 3 vehicles, and the chemistry lab required removal actions
- Student stole mercury from school chemistry lab
- Other house showed slightly elevated levels
- Response lasted 5 days

- High profile.
  - Media attention
  - Angry citizens
  - Set off wave of mercury calls
- Response cost:
  - $13,000 for clean-up.
  - $15,000 for technical assistance

The student had found the mercury in the chemistry lab storage room and stole it. He brought mercury on a bus and put it in the center aisle runnels watching it flow up and down the aisle as the bus moved or stopped. Once everyone involved was identified sampling began to determine where action was necessary. The cost of the response was about $28,000.

Case Study: Hawthorne Avenue Spill

- Child breaks thermometer in living room
- Parent notifies 911
- Fire Department responds
  - Appropriate response until they utilized resident's vacuum to collect residual mercury
- Increased breathing zone levels throughout house
- Additional source identified and removed
  - 6 inch by 3 inch strip of carpet
  - Ventilated couch cushion
  - Decontaminated vacuum cleaner
- Ventilated house for a number of days
- Clean-up cost: $1,000

A common mistake made in addressing a mercury spill in the home is the use of a vacuum cleaner to attempt to clean up the spill. This action can change a relatively minor mercury spill into a spill requiring immediate attention. Thought the clean-up cost was $1000, that does not include the cost to the family for replacing items removed by the clean-up.

Case Study: Sage Avenue Spill

- Son notified parent that his brother had been playing with mercury
- Source was secured immediately by first responders
  - 0.25 pounds spilled
- Entire house was screened
- Impacted area sealed off from rest of house
- Family permitted to remain in house until clean-up occurred
- Minimal clean-up required
- Clean-up cost: < $5,000

Mercury spills are expensive even when a response is prompt. A quarter pound of mercury is a fairly large amount of mercury and the contamination could have been much worse and much more expensive to clean up. The best solution is not to have mercury or mercury-containing products in a home.

Case Study: Ginger Avenue Spill

- Up to 15 pounds of mercury spilled in garage
- Air conditioner draws air from garage
- Following visible source removal, continued high vapors
- Overnight ventilation required prior to continued source identification
- Dry mercury vapor suppressant application
- Clean-up cost: $10,000 (est.)

Case Study: Springfield Mercury

- Teenagers found over 100 pounds of mercury in and abandoned facility.
- Mercury was distributed among friends
- 16 homes were contaminated
- The 6 “R’s” model was developed
- All 16 homes were deconned in less than 1 month.
- Gained a lot of media attention
- Cost approached $500,000

This is one of Ohio’s largest mercury clean-ups and occurred in 1997 in Springfield, Ohio. Thirty-one houses and apartments were monitored and 16 homes were found to be contaminated, so the families were displaced during monitoring and clean-up. In one house in particular, two children demonstrated symptoms of acute mercury poisoning. U.S. EPA developed its mercury response model, the 6 R’s model, shown earlier because of this spill. The spills triggered mercury collection events in Springfield and over 200 additional pounds of mercury were collected after the spill response. Despite this hug spill Springfield, Ohio was the site of another large spill in 2000, when children found a drum of abandoned mercury relay switches.

Mercury Presentation Agenda

- Pollution prevention and management of mercury and mercury devices

Almost every commonly used mercury product has a mercury free alternative that is just as effective and affordable. This section walks you through some easy steps to reduce mercury in your home or business.

It really is a simple idea, if mercury is not in the home, school or business, it can not be spilled, charge of no clean-up: free.

What can be done about mercury?

- Educate
- Identify use
- Consider alternatives
- Remove/recycle unnecessary mercury
- Replace equipment that has mercury
- Energy efficiency

There is great potential to address mercury and reduce its risk where-ever it is found. One of the best things that can be done is to educate everyone about mercury issues, including, your family, coworkers and employees at work, and students at school.

Identify where there is mercury or mercury containing devices in your home or workplace.

When old mercury containing devices are replaced make sure that they are sent to a recycler and replace them with mercury free alternatives. This is also an opportunity to get more efficient products.

Also it is a good time to consider that anytime you improve energy efficiency, you are effectively reducing the amount of mercury being released through the generation of electricity.

If your business has a laboratory or you perform demonstrations in the laboratory in a school setting, substitute other chemicals to demonstrate similar reactions, or if you must use mercury perform microscale experiments. Also remove excess mercury from the labs, if it is not necessary. Mercury can also build up in laboratory plumbing, especially in schools. All work on plumbing in a laboratory should be done with care.

Ohio mercury bans

HB 443 - 2007

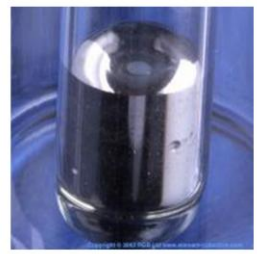
"The most effective approach to ensuring that mercury from products is not released into the environment is to phase out nonessential uses and to replace those uses with safer alternatives (Environmental Council of States)."

Purchase ban

- At schools

Statewide sales bans

- Mercury thermometers
- Mercury thermostats
- Novelty items



The State of Ohio passed House Bill 443 in January, 2007. The law establishes 4 bans including:

Prohibits schools from purchasing elemental mercury, chemical mercury compounds, and mercury added measuring devices for classroom use effective April 6, 2007.

Prohibits the sale of mercury thermometers effective October 6, 2007.

Prohibits the sale, installation, or re-installation of commercial or residential thermostats, effective April 6, 2008 . Exemptions exist for thermostats used by the blind or visually impaired and when the thermostat is used as part of a manufacturing process

Prohibits the sale or distribution of mercury-added novelty items, effective October 6, 2007. Novelty items containing button cell batteries cannot be sold in Ohio as of January 1, 2011.

If mercury-containing products must be used

- Use products with the least amount
- Proper management
- Have a mercury spill plan
- Improve Energy Efficiency

If you have mercury containing equipment, take care of it and maintain it correctly to reduce the risk of a spill.

You should have a spill plan in case a spill occurs. It is always best to send mercury containing products to a recycler. If you are a homeowner, look for a recycler, a trade in program or find out when the next household hazardous waste day is. Businesses must determine if the mercury product is a hazardous waste or a universal waste. Fluorescent lamps and thermostats are universal wastes and must be managed as such. There are some proposals to make all mercury containing products universal wastes but they are still in the proposal stage (2005).

Finally, improving energy efficiency and using energy conserving practices will reduce the amount of mercury released into the atmosphere by the combustion of coal for energy.

How can a business reduce mercury? It is as easy as 1-2-3!

- 1 - Conduct a baseline inventory to determine what mercury containing items are present in your home or facility

- Thermometers
- Thermostats
- Barometers
- Silent wall switches
- Industry specific equipment
- Button cell batteries
- Fluorescent lamps
- Chemicals in the labs
- Old latex paints and old pesticides

These steps are designed for businesses, however they can also be used at home. The first step is to identify where mercury is located in your home or work.

How can my business reduce mercury ? Easy! 1-2-3

- 2 - Set mercury reduction goals
  Develop quantifiable mercury goals for reduction

This is especially true for a business. However, home owners can also make plans for updating their appliances and personal property.

How can my business reduce mercury? Easy! 1-2-3

- 3- Develop an action plan and track your progress
  - Develop a Team
  - Educate employees, janitorial staff
  - Identify mercury use at facility: MSDS, equipment review
  - Remove/recycle unnecessary mercury
  - Good Housekeeping
  - Purchasing Procurement Specs
  - End of life, replace equipment that has mercury or proper disposal
  - Have a spill plan
  - Drain trap clean outs
  - Energy Efficiency

Drain trap clean outs are appropriate if your business has used mercury and there is potential for it to have been dumped down a drain.

By tracking your progress you can determine what worked for you and what needs more effort or to be reconsidered.

Mercury and mercury device disposal requirements

- Evaluate to determine if materials need to be managed as hazardous waste
- **Illegal** to throw hazardous materials in trash
- Recycling exemption
- Thermostats and fluorescent lamps are universal wastes
- All mercury devices proposed universal waste

This slide is for businesses.

Businesses need to evaluate if any material, including mercury containing items, are hazardous. Since mercury is toxic, products containing mercury are often defined as hazardous. Hazardous waste must be disposed at an appropriate hazardous waste treatment or disposal facility. If you send mercury containing products to a recycler you can meet the exemption requirements. Thermostats and fluorescent lamps are defined as universal waste and you must manage them as such. More information on universal wastes are available at: http://www.epa.gov/epaoswer/hazwaste/id/univwast.htm. U.S. EPA is currently (2005) has written rules making all mercury containing devices universal waste, these rules have not yet been adopted in Ohio.

Thermostat Recycling Corporation

- WWW.NEMA.ORG/TRC
- Free to contractors
- Contractors bring thermostats to participating wholesaler
- Wholesaler cost $15

The Thermostat Recycling Corporation (TRC) facilitates the collection by HVAC wholesalers from contractors of all brands of used, wall-mounted mercury-switch thermostats so that the mercury can be purified for re-use. Wholesalers will be provided a collection box for $15 which includes shipping prepaid. When the collection box is full, the wholesaler sends in the box and receives a new one from TRC. Contractors may drop off any collected thermostats at participating wholesalers. For more information go to : www.nema.org/trc

Bowling Green State University Elemental Mercury Collection and Reclamation Program

- Began collection in 1998
- Coordinates with Rader Environmental and Ohio EPA
- Statewide elemental mercury collection
- Mercury and mercury-containing devices
- Free of charge
- Over 20,000 pounds of elemental mercury collected
- Accepting donations to defer costs
- www.bgsu.edu/offices/envhs/page18364.html

The Bowling Green State University (www.bgsu.edu/offices/envhs/page18364.html)operates an elemental mercury collection and reclamation program. They will work with communities, businesses and individuals to pick up elemental mercury or devices containing elemental mercury anywhere in Ohio free of charge.

So…
Why is mercury a concern to you?

- Mercury is a **toxic** chemical
- It is in many products used today
- Alternatives are available
- **Liability**/responsibility to customers
- Air, water, waste regulations
- Cleaning up a mercury spill is **costly**
- Public relations
- There are people who can help

The first portion of the training has focused on mercury's toxicity. Mercury exposure is dangerous for your health and the health and learning capacity of your children. It also has impacts wildlife and can cause illness in wild animals. On August 25, 2004, The Director of the U.S. EPA stated that the fish in almost every lake and river and stream in the United States are contaminated with mercury, for which there is no safe exposure level. Ohio has a statewide fish advisory for mercury as well.

Mercury is in a lot of products. It's use in those products is not at issue. However, what happens to those products at the end of their life, during maintenance or when they break creates a route for mercury to reach the environment. In most products there are economic and effective alternatives that do not contain mercury.

If there is a mercury spill or a product is broken, it costs a lot of money to clean-up a little spill. That $1.00 fever thermometer can cost close to $1000 to clean-up. Other spills cost more. In many residential cases insurance will not pay for the clean-up, so there is a question on who is responsible for paying for it.

Mercury is regulated in air, water and waste regulations. Businesses must evaluate mercury and mercury-containing products to determine if they are hazardous waste. Hazardous waste must be recycled or handled as universal or hazardous waste.

Mercury Presentation Agenda

- Resources

This next section identifies some of the resources that are available to learn more about mercury and to help you reduce mercury in your home or business.

Ohio Mercury Reduction Group

- State of Ohio multi-agency workgroup
- The primary goal of OMRG is to protect the environment and public health in Ohio against mercury exposure and the adverse effect of mercury
- Focuses on raising awareness and providing educational materials to reduce mercury
- Facilitates the collection of mercury and retired mercury-containing devices
- http://www.epa.state.oh.us/ocapp/p2/mercury_pbt/omrg.html

The Ohio Mercury Reduction Group is a networking group of state and local government agencies. At the local level city and county health departments participate and provide input on mercury reduction projects throughout the state. The group has worked to raise awareness of other counties, spill responders, home owners, schools, and POTWs of mercury issues. The group is also an excellent resource for anyone who is developing a mercury reduction program.

Pollution prevention information available for the following mercury sectors

- Households
- Communities
- Dairy farms
- Dental Offices
- Hospitals
- Schools
- Wastewater treatment plants

The Office of Compliance Assistance and Pollution Prevention (OCAPP) has several fact sheets and checklists available to help with specific groups or sectors.

Fact sheets are available for Ohio's mercury bans, schools, dairy farmers, dental offices and households.

A Guide to Mercury Issues for School Administrators offers a comprehensive look at mercury issues in schools.

The mercury challenge handbook provides guidance on mercury use reduction in hospitals.

The Developing a Community Mercury Reduction Program helps a community develop a program and has specific checklists for households, schools, hospitals and wastewater treatment facilities.

Links are also available to the National Mercury Vehicle Switch Removal Program for auto recyclers and scrap yards.

These resources are all available at:
http://www.epa.state.oh.us/ocapp/p2/mercury_pbt/mercury.html

Mercury P2 Assistance:

- Ohio EPA – Office of Compliance Assistance and Pollution Prevention
  614-644-3469
  http://www.epa.state.oh.us/ocapp/p2/mercury_pbt/mercury.html
- Ohio EPA Spill Hotline: (800) 282-9378
- Poison Control Center: (800) 222-1222
- Ohio Mercury Reduction Group
  http://www.epa.state.oh.us/ocapp/p2/mercury_pbt/omrg.html
- Bowling Green State University Mercury Collection Program
  419-372-2173 http://www.bgsu.edu/offices/envhs/page18364.htm
- Mercury Recyclers in Ohio
  http://www.epa.state.oh.us/opp/recyc/mercrec.html

Some resources to note, the Ohio EPA Office of Compliance Assistance and Pollution Prevention to help identify mercury containing items, alternatives and resources; the Spill Hotline in case of a spill; BGSU to pick-up your elemental mercury for recycling; and the mercury web page for more information.