

Mercury Spills: Response, and Recovery



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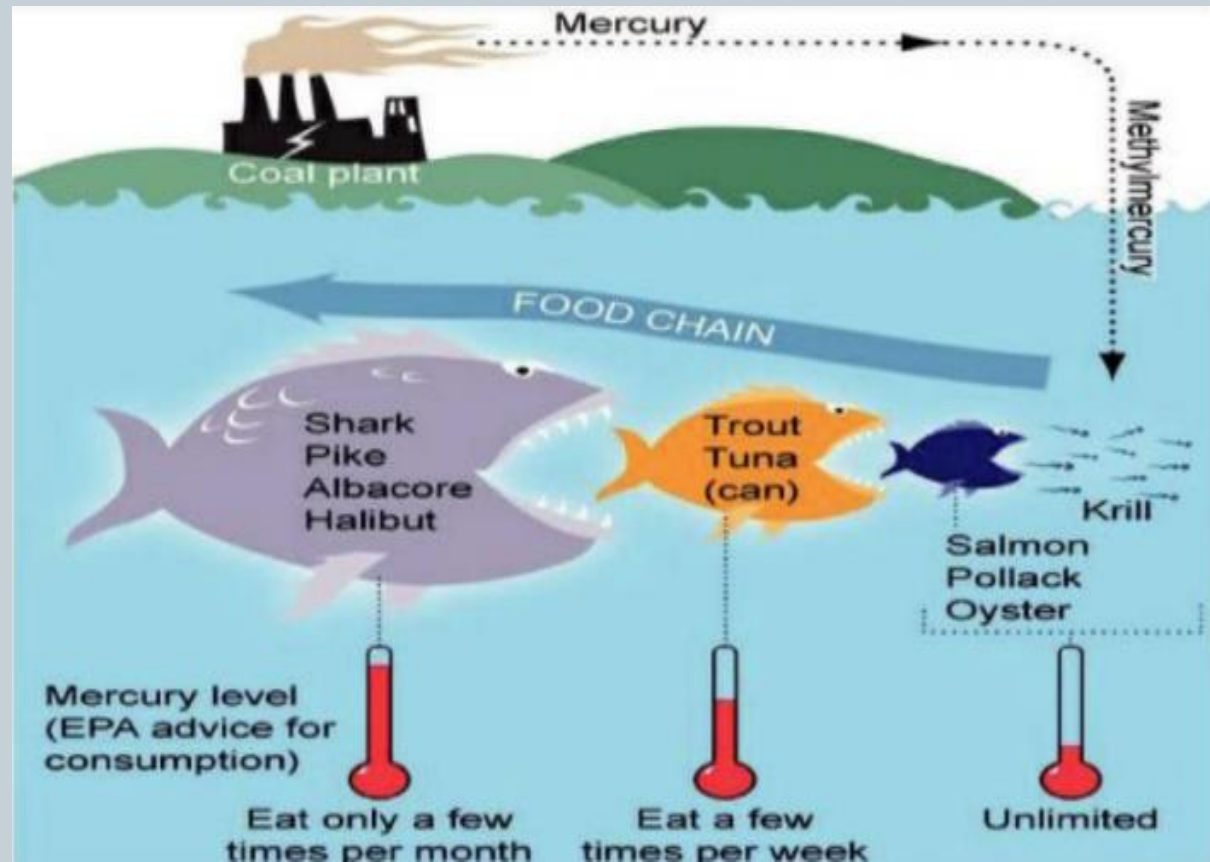
Objectives



- Understand sources and health effects of Mercury exposures
- Identify actions to take when you learn about a Mercury spill
- Recognize local, state and partners available to assist with a spill
- Hatch Street case study

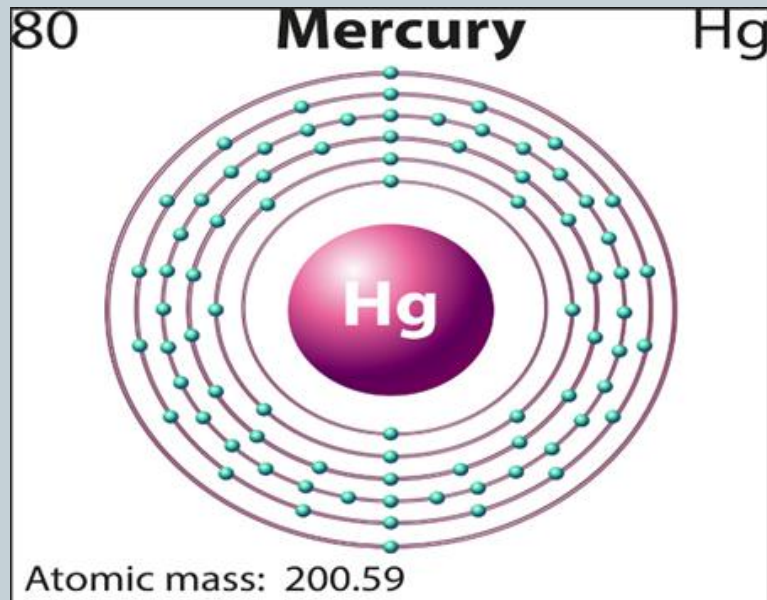
Why is Mercury a Concern?

- There are three forms of Mercury:
 - elemental mercury
 - inorganic
 - ✦ (salts)
 - organic mercury
 - ✦ (carbon based compounds)



Why is Mercury a Concern?

- Elemental (Liquid or Metallic) Mercury (Hg) is shiny, silver-white, odorless liquid



Why is Mercury a Concern?



- Elemental mercury will volatilize at any temperature above -38 degrees Fahrenheit (°F)
- Since it volatilizes into the air, exposure to elemental mercury is mainly a concern for inhalation of vapors
 - Even when hands are contaminated, mercury vapors off gassing is the greatest hazard
- A small amount of elemental mercury can result in high levels of mercury vapors in the indoor air
- Elemental mercury can be easily tracked around to cause inhalation risks in other locations or to the environment

Health Effects of Mercury Exposures

- Acute Mercury Poisoning may Include:
 - Rashes (Petechiae) - especially on hands and feet
 - Oral Sores and bleeding (mouth and nose)
 - Fevers
 - Shortness of Breath / Respiratory distress
 - Memory loss, confusion, and/or irritability
 - Tremors / neurological problems
 - Stomach pains, nausea or vomiting, diarrhea

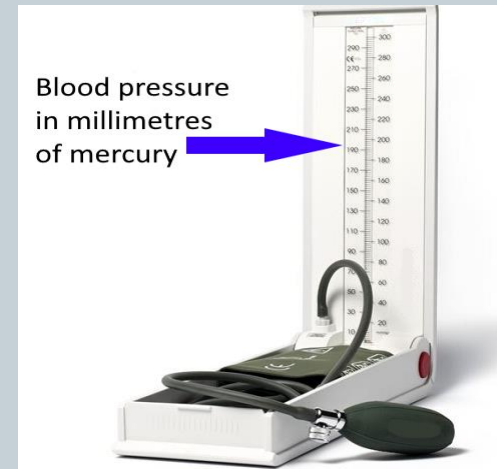
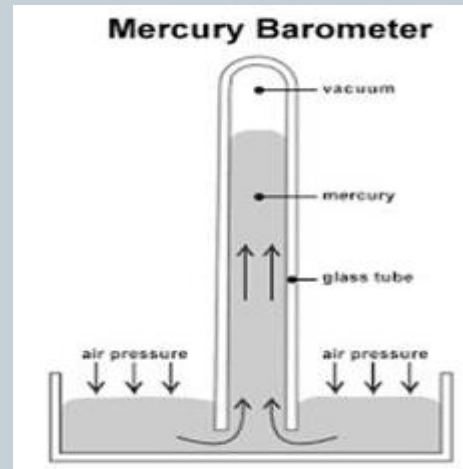
Acute exposure can lead to death!

Figure 2-1: General Symptoms of Mercury Poisoning

Acute Mercury Poisoning	Acute Elemental Mercury Vapor Poisoning	Chronic Mercury Poisoning
<ul style="list-style-type: none">•Irritation & burning of the skin/eyes•Fever•Colic•Skin allergies & hypersensitivity•Memory loss•Disturbances in vision•Acrodynia•Elevated blood pressure•Metallic taste•Weakness•Tremors•Abdominal pain•Fretfulness•Insomnia•Diarrhea•Sleeplessness•Headache•Nausea•Excessive salivation/sweating•Irritability•Vomiting•Itching•Lassitude•Swelling•Stomatitis	<ul style="list-style-type: none">•Kidney damage•Pulmonary edema•Lung irritation with coughing•Bronchitis•Sorethroat•Pneumonitis•Chest pain or tightness•Shortness of breath	<ul style="list-style-type: none">•Anxiety•Irritability•Changes in hearing•Excessive shyness•Fatigue•Weight loss•Forgetfulness•Insomnia•Tremors•Loss of appetite•Changes in vision

Where is Elemental Mercury Found?

- Thermometers (not recommended for food inspections!)
- Older thermostats and barometers
- Medical equipment like older blood pressure cuffs
- Old clock pendulums



Where is Elemental Mercury Found?

- Old mirrors
- Dental filling (amalgam)
- Electrical switches
- Light bulbs
- Industrial uses
- Cultural practices



Environmental Protection Agency (EPA)



- Under the National Oil and Hazardous Substances Pollution Contingency Plan (**NCP**), EPA has authority to respond to releases that may present an imminent and substantial endangerment to public health
- In general, small releases (e.g., broken CFLs, thermometers and thermostats) can be addressed through technical advice
- Request for EPA assistance for a Hg Spill can come from a phone call, often by a state environmental department.
- EPA can potentially assist with characterizing the spill, relocation of residents, and clean up.
- EPA has a headquarters (Washington, DC) and Regional Offices

Agency for Toxic Substances and Disease Registry (ATSDR)



- ATSDR is a non-regulatory, public health agency
- Can assist with identifying exposures and determine if there is a health impact from those exposures
- **Worked with EPA to create Mercury Action Levels (1-10ug/m³)**
- ATSDR has Headquarters (in Atlanta) and in 10 Regional Offices
- Can make referrals to medical providers who specialize in Environmental Exposures
- Assistance from ATSDR can be made at the request of EPA, state or local agency, or even a community member
- 24-hour number is 770-488-7100 and ask for the “ATSDR Duty Officer”

Reporting a Spill



An uncontained spill larger than one pound (approximately two tablespoons) that is released to the environment requires a notification to the National Response Center (NRC)

(800) 424-8802

How common is a mercury spill?



The National Response Center (NRC) serves as an emergency call center for INITIAL reports for pollution and railroad incidents. NRC forwards that information to appropriate federal/state agencies for response.

Year	Number of NRC reports with unique ID numbers	Number of unique ID reports with "Mercury" listed as "name of material"
2018	25,592	61
2019	25,759	67
2020	22,503	61
2021	24,520	55
2022	23,510	65

Data from NRC was retrieved on 01/20/2023 from [USCG National Response Center Home Page](#)

First Steps



Upon hearing of a Mercury Spill, here are some good first steps:

- Ensure everyone evacuates the space
 - Leave potentially contaminated items behind, **DO NOT take items/clothing/shoes** without screening
 - If there is no way to screen items/clothing/shoes, place those things in bags to screen once screening equipment is available
 - Start a list of people who were potentially exposed and collect contact information
- If not already done, contact local HazMat resource to help identify the extent of the spill
- Secure the scene and do not remove materials from site

First Steps continued



- Consider if the spill is large enough to report to NRC and state partners (two tablespoons)
- Determine who is part of the response and start collaboration:
 - **Local:** HazMat, Public Health, Building & Code enforcement, etc.
 - **State:** State Environmental Departments, State Health Departments, etc.
 - **Federal:** EPA, ATSDR, etc.
 - **Others:** Medical providers, Occupational health, Pediatric Health Specialty Unit, Clean Up Contractors, etc.
- Start to create a timeline of the event and the people involved

Creating a Timeline Document



- As response grows, a timeline provides clear, concise facts
- A timeline helps identify gaps in knowledge and potential exposures
- A timeline is a living document that will be updated as more information becomes available
- It may be easiest to assign one person to be the “keeper” of the timeline

Questions to Help Build Timeline



1. When and How did the spill occur, including estimated volume and time since spill occurred?
2. Was a cleanup attempted?
3. How was the cleanup conducted?
4. What actions / air samples have been taken, including instruments used?
5. Who handled the spill or who was present during the spill?
6. Where did the mercury originate?
7. Where was the mercury detected?
8. Was the mercury taken to another location?
9. Was the mercury container opened or was the mercury handled anywhere else?
10. Has any individual been in direct contact with mercury?
11. What is the number, ages, and ethnicities of people living in the home?
12. Who rents, leases or owns the property and is it insured?
13. For businesses or schools, has a qualified environmental cleanup contractor been contacted? If so, does the contractor have mercury cleanup experience?

Timeline Example

CT DEEP Spills: Rick Swan, others?

ESI, Inc: env. cleanup contractor for DEEP

CT DPH: Meg Harvey, Amanda DeLoreto, David Kallander, Cheryl Fields

ATSDR Region 1: Tarah Somers

New Britain Health Dept: Sergio Lupo-Dir of Health, Caleb Cowles-Supervising Sanitarian

Yale Occupational and Environmental Medicine (OEM) Program: Dr. Carrie Redlich,

CT Children's Medical Center: Dr. Hareem Park-treating physician for 2 children hospitalized

EPA: Alex Sherrin, Incident Commander



Occupants: Living in the Home (9 Residents)

Family member living in the home	Relationship	Date of 1 st mercury blood test
Female 47 yo	Mom, Primary Family Contact	8/9/2022
Male 48 yo	Partner	8/9/2022
Male 28 yo	son	8/9/2022
Male 26 yo	son	8/11/2022
Female 18 yo	daughter	8/9/2022
Male 15 yo*	son	8/8/2022 (*hospitalized on 8/3)
Female 14 yo	female	8/9/2022
Male 13 yo	son	8/9/2022
Female 5 yo*	female	8/8/2002 (*hospitalized on 8/3)
		Results range from 125 ug/L to 310 ug/L



(Protect Confidentiality of individuals)



Additional people who may have spent time at the home	Relationship	Details
Female	Aunt	May have spent a night in the house (info from Dr. Redlich)

Timeline Example



Start with important date

- **July ? 2022**
- Family moved into home from Waterbury.
 - GAP date family moved in
- **Spill Date (Still TBD)**
- *Estimated* date of spill of a volume of mercury that would fill a 10 oz (~300 ml) coffee mug.
 - Information on size of spill reported by 15yo to Dr. Redlich on 8/18
- Mercury was spilled on carpet of bedroom in home by 5 yo.
 - GAP: was this spill the first-time children handled the mercury?
- Mercury was in the home in a “bottle like container” left by previous owner.
 - GAP: was container of Hg sealed/lidded container?
- 9 occupants of home slept in bedroom because it was the only room in the home with AC (heat wave during this time period).
- **GAP: Spill date (TBD) – AUG 8th, 2022 (event notification) – Movement of residents throughout community & movement of objects within home**
- **AUG 3, 2022**
- Mom brings 5 yo and 15 yo to Waterbury Hosp. Children are presenting with petechiae, oral sores, mouth and nose bleeding, fever. Something infectious is suspected (info from medical chart)
 - GAP: Unknown how they traveled there (it's not in their med chart).
- CCMC ED receives call from Waterbury ED requesting transport of both children to CCMC. EMS transports them late on 8/3.
 - GAP: Was ambulance that transported children screened?



Highlights can bring attention to gaps

It is helpful to put document date & time at top of document each time it is saved / sent to team

Timeline Example



Timeline can help identify additional places to screen

Potential Secondary locations to screen

Location	Justification	Information source	Date Screened
Accord – with family	Family vehicle still being driven.	Mom	
CRV – at home	Family vehicle was driven between 7/27 - 8/8	Mom	
Subaru – at home	Family vehicle was used until 8/8	Mom	
Aunt's house	Aunt spent time between the homes & also some family went to aunt house on night of 8/8	Mom / Aunt	
Ambulances	2 ambulances were used to transport children on 8/3 between Waterbury and CCMC	AMR	
Warehouse	Mom and 26yo brother work in warehouse	Mom	
Public Buses	26yo takes bus to work	Mom	

Assessing Extent of Contamination



- Often assessed using real-time Mercury Vapor Analyzer (MVA):
- Jerome J505 range 50-500,000 ng/m³ or 0.005 - 50 ug/m³
- Lumex RA-915 range 20-200,000 ng/m³ or 0.002 - 20 ug/m³



Assessing Extent of Contamination



- Understand what units will be reported by the instrument
- Indoor air above $25 \mu\text{g}/\text{m}^3$ require upgrade of PPE to at least Level C
- Readings taken closer to the spill – such as the floor – will produce higher readings
- Readings taken at breathing height help determine exposures to occupants - consider breathing heights of adults and small children
- Readings greater than $10 \mu\text{g}/\text{m}^3$ is a decision point for temporary relocation of occupants

Incident Action Plan



A living document based on the ICS for objectives and project assignments to manages the response. *Incident Objective* summarizes the project and each response branch will have their own *Assignment List* which contributes to the whole report.

- 1. Rehousing Division
- 2. Assessment Branch
- 3. Public Health
- 4. Safety

INCIDENT ACTION PLAN HATCH STREET MERCURY RELEASE



Mercury Clean Up



- EPA has resources for assisting with clean up
- Clean up plan will depend on levels of Hg found on site
- Indoor clean of large spills up can include:
 - Physical removal of mercury
 - Use of mercury absorbents
 - Removal of contaminated personal items
 - Heating and venting of the space
 - Removal of plumbing or items such as washing machines
- Clean up takes time – often many weeks
- Very Costly!

Re-Occupancy of Space



- To help ensure a space is safe for re-occupancy, post clean up screening is conducted
 - Temperatures in the space are back to residential room temperatures
 - Air movement inside has stabilized with windows and door closed
 - Mercury vapor concentrations should be less than the desired action level (usually $1.0 \mu\text{g}/\text{m}^3$ for residential)
- In almost all instances, the local or county public health department will determine if a building is safe for human occupancy
 - EPA provides reports and data
 - State Health Departments and ATSDR can provide assistance to locals

Hatch Street Case Study



- **Background**
- **Initial Call & Response**
 - Triggered by notification from Connecticut Children's Medical Center
 - CT State Department of Energy and Environmental Protection and local partners, police, fire and health respond.
 - Basic assessment made
 - Family relocated
- **Call for help**
 - Extent of spill determined
 - CT DEEP requests assistance from Federal partners.
 - Triggered Superfund Technical Assessment Response Team (START)

Hatch Street Case Study



- **Medical response**
 - Critical response
 - ✦ In patient treatment
 - Clinical oversight
 - ✦ Locating a provider
 - Chelation
 - ✦ Access to adequate supply of CHEMET meds (1,500 capsules)
 - Access to clinical location
 - ✦ Out of town travel

Hatch Street Case Study



- **Initial decontamination**
 - Removal of gross materials and personal belongings
 - Spill room abatement
 - ✦ Mercury Vacuum (Merc Vac)
 - ✦ Powder application (HgX)
- **Screening and remediation**
 - Heating and venting
- **Post remediation clearance monitoring**
 - Mercury analyzers
 - Testing protocols
 - Clearance below 1.0ug/m³

Some Lessons Learned



- Rely on partner agencies – Don't hesitate to ask for assistance!
 - Federal Agencies can bring experience and resources
 - Know your contacts
- Frequent Joint Conference Calls
 - Establish timeline, secondary locations, exposed individuals
 - Prioritize secondary locations and if they are warranted for a screening
 - Information sharing between agencies
- Try to have one person from response be the primary contact for the family/exposed individuals
- Be Careful with Units
 - Try to stay consistent with ng (nanograms) or μg (micrograms)

Some Lessons Learned



- Scene safety for responders is important - many hazards can be on site
- Don't reinvent the wheel
 - Use resources available (modify the wheel)
- Manage the expectations of the community involved
 - Door to door, fact sheets, overall community outreach
 - Time it takes to identify then clean up the spill
 - Site Security
 - Media interest
 - Political interest

Mercury Spill Prevention



- Raise awareness locally about the hazards of mercury
- Know what local resources you have for safe disposal of mercury containing items
- Support & advertise local Hazardous Waste Collection days
- If you identify objects with mercury in homes, inform homeowners how to safely remove these objects
- Consider promotion of “*Don’t Mess with Mercury*” materials in local schools

Resources



- EPA *National Elementary Mercury Response Guidebook, 2019*
- EPA Mercury Website <https://www.epa.gov/mercury>
- *Chemical-Specific Health Consultation for Joint EPA/ATSDR National Mercury Cleanup Policy Workgroup Action Levels For Elemental Mercury Spills, 2012*
- ATSDR Don't Mess with Mercury website <https://www.atsdr.cdc.gov/dontmesswithmercury/index.html>