



Mercury

Health Effects and Reducing Exposure

Learning Objectives

- ⇒ Identify sources of mercury
- ⇒ Discuss health effects of mercury
- ⇒ Determine actions for reducing exposures to mercury

Description and Sources: Elemental Mercury

- ⇒ Shiny silver liquid at room temperature
- ⇒ Vaporizes to colorless, odorless gas
- ⇒ Organic (methyl mercury) more harmful than inorganic form
- ⇒ Found at 714 National Priority List sites

Uses

- ⇒ Switches
- ⇒ Thermometers
- ⇒ Barometers
- ⇒ Batteries
- ⇒ Fluorescent lights
- ⇒ Chlorine gas production
- ⇒ Blood pressure cuffs
- ⇒ Fungicides
- ⇒ Industrial uses



Minnesota Pollution Control Agency

Ingestion Exposure

- ⇒ Bioaccumulation (build-up) in food chain
 - Old large fish and shellfish (swordfish, tuna, king mackerel, shark, and tilefish)
 - Drinking water
 - Cereals
 - Vegetables (mushrooms)
 - Meats
- ⇒ Silver dental fillings - especially with chewing gum



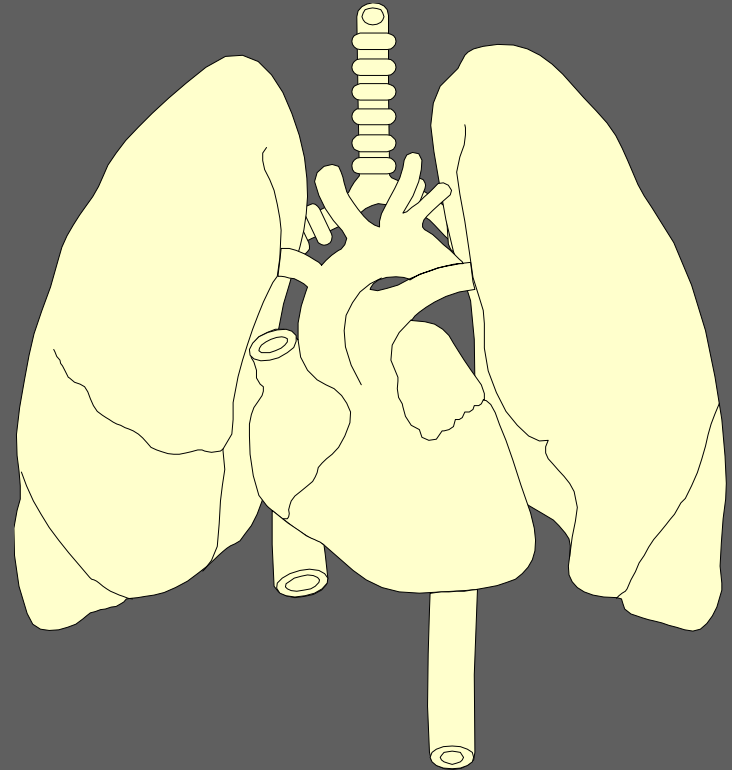
Skin Exposure

- ⇒ Spills
- ⇒ Home remedies
- ⇒ Cosmetics
- ⇒ Cultural practices that use mercury

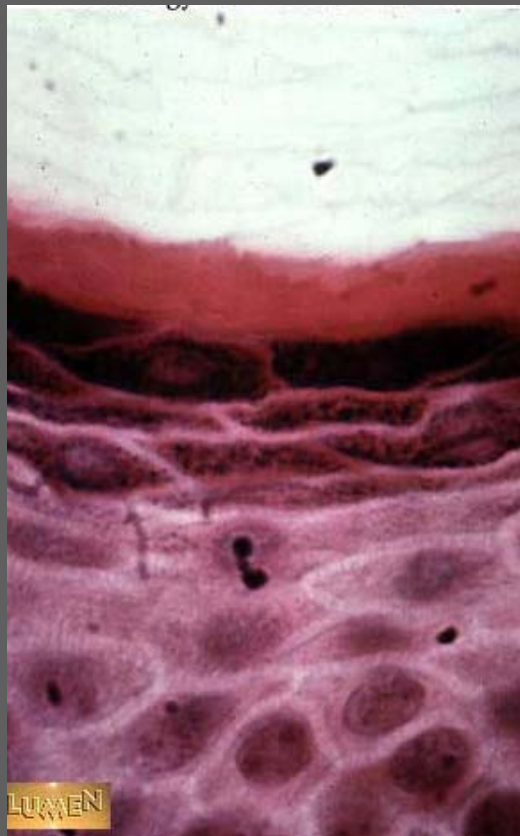


Inhalation Exposure

- ⇒ Breathing air from combustion or spills
- ⇒ Mining
- ⇒ Coal-burning power plants (1/3 of US releases)
- ⇒ Natural deposits
- ⇒ Disposal and incineration of solid wastes containing mercury
 - Municipal
 - Hospital or medical



Health Effects: Contact



- ⇒ Irritation of skin and eyes
- ⇒ Skin allergy with itching and rash
- ⇒ May cause graying of the skin

Loyola University Medical
Education Network

Exposure



- ⇒ Regardless of what route of exposure – once inside the body mercury is eliminated very slowly and builds up over time.

Health Effects: Inhalation

- ⇒ Irritate lungs
- ⇒ Cough
- ⇒ Shortness of breath
- ⇒ Chest pain
- ⇒ Nausea/vomiting
- ⇒ Diarrhea
- ⇒ High blood pressure
- ⇒ Repeated low exposure or single does high exposure:
 - Tremors
 - Impaired memory and concentration
 - Mood changes
 - Weight loss
 - Decreased appetite

Health Effects: Nervous System

- ⇒ Irritability
- ⇒ Shyness
- ⇒ Tremors
- ⇒ Altered vision or hearing
- ⇒ Impaired memory
- ⇒ Language and attention deficits
- ⇒ Delayed nerve conduction and pins and needle feeling
- ⇒ Seizures
- ⇒ Brain damage

Health Effects: Reproductive/Developmental

- ⇒ Increased miscarriages
- ⇒ Infant deafness
- ⇒ Blindness
- ⇒ Mental retardation
- ⇒ Cerebral Palsy
- ⇒ Low birth weight



Health Effects: Other

- ⇒ Possibly causes cancer
- ⇒ Kidney damage
- ⇒ Cardiovascular effects
- ⇒ Cumulative effect – increased toxicity when combined with other contaminants such as PCBs

Indications of Exposure



- ⇒ Urine – test for exposure to metallic mercury vapor and inorganic mercury
- ⇒ Blood – test for recent exposure to methyl mercury
- ⇒ Hair – detect exposure to methyl mercury from longer ago
- ⇒ Breast milk

How to Reduce Risk

➔ Work exposure

- Proper protective equipment and ventilation.
- Wash immediately after exposure and before going home
- Change clothes at work and launder separately

➔ Reduce use

- in manufacturing, products, and incineration.
- Buy mercury-free alternatives

➔ Prevent exposure

- Careful handling and disposal of mercury products such as thermometers and fluorescent lights
- Do not vacuum spilled mercury because it will vaporize
- Do not incinerate mercury containing products

How to Reduce Risk

- ⇒ Choose non-mercury containing dental fillings. It is not recommended to replace metal fillings just to remove mercury because will increase exposure
- ⇒ Selenium and Vit. E may be protective against methyl mercury

How to Reduce Risk

⇒ Follow FDA/EPA fish advisories

www.epa.gov/waterscience/fishadvice/advisory.pdf

- Pregnant women, nursing mothers and young children should not eat shark, king mackerel, tile fish or swordfish
- NOTE: Although the current federal fish advisory suggests that 6 oz of White/albacore tuna or 12 oz of chunk light tuna per week is acceptable, other public health groups recommend vulnerable populations avoiding them altogether. (Got to www.ewg.org/issues/mercury/index.php for more information).
- Limit intake of other types of fish to 12 ounces a week (3-4 servings depending on size)

Policy

- ⇒ EPA maximum intake level of 0.1 mcg/kg/day may not be protective enough
- ⇒ EPA and FDA drinking water limit for inorganic mercury is 2 ppb
- ⇒ FDA limit for methyl mercury in seafood is 1 ppm
- ⇒ OSHA 8 hour shift 40 hour work week limit for organic mercury is 0.1 mg/cubic meter and 0.05 mg/cubic meter for metallic mercury vapor
- ⇒ NIOSH recommends 10 hour shift average air limit of 0.05 mg/cubic meter

Resources

- ⇒ ATSDR ToxFAQs www.atsdr.cdc.gov/tfacts46.pdf
- ⇒ NJ Fact Sheet
www.state.nj.us/health/eoh/rtkweb/1183.pdf
- ⇒ EPA Chemical Fact Sheet
www.epa.gov/OGWDW/dwh/t-ioc/mercury.html
- ⇒ Scorecard www.scorecard.org/chemical-profiles/summary.tcl?edf_substance_id=7439-97-6

In Review

- ⇒ What is mercury and how are we exposed to it
- ⇒ How does mercury effect our health
- ⇒ How can we reduce our exposure to mercury

References

- ➔ Agency for Toxic Substances and Disease Registry (1999). Mercury. Public Health Statements. Available on-line: <http://www.atsdr.cdc.gov/toxprofiles/phs46.html>
- ➔ Agency for Toxic Substances and Disease Registry (1999). Mercury. ToxFAQ's. Available on-line: <http://www.atsdr.cdc.gov/tfacts46.pdf>
- ➔ Ask, K., Akesson, A., Berglund, M., & Vahter, M. (2002). Inorganic mercury and methylmercury in placentas of Swedish women. Environmental Health Perspectives, 110(5): 523-526.
- ➔ Bemis, J. & Seegal, R. (1999). Polychlorinated biphenyls and methyl mercury act synergistically to reduce rat brain dopamine content in vitro. Environmental Health Perspectives, 107(11): 879-885.

References

- ⇒ Coccini, T., Randine, G., Candura, S., Nappi, R., Prockop, L., & Manzo, L. (2000). Low-level exposure to methyl mercury modifies muscarinic cholinergic receptor binding characteristics in rat brain and lymphocytes: Physiologic implications and new opportunities in biologic monitoring. Environmental Health Perspectives, 108(1): 29-33.
- ⇒ Environmental Protection Agency (2000). EPA Region 3 Risk Based Concentration Table. Available on-line <http://www.epa.gov/reg3hwmd/risk/rbc.pdf>

References

- ⇒ FDA and EPA (2004). What you need to know about mercury in fish and shellfish. Consumer Advisory. Available online: <http://www.epa.gov/waterscience/fishadvice/advisory.pdf>
- ⇒ Loyola University Medical Education Network (2002). Anatomy Photographs. Available on-line at: <http://www.lumen.luc.edu/lumen/>
- ⇒ Methyl mercury's toxic toll (2000). Science News, 158: 77.
- ⇒ Myers, G. & Davidson, P. (2000). Does methylmercury have a role in causing developmental disabilities in children? Environmental Health Perspectives, 108(supplement 3): 413-420.

References

- ⇒ New Jersey Department of Health and Senior Services (1998). Mercury. Hazardous Substance Fact Sheet. Available on-line: <http://www.state.nj.us/health/eoh/rtkweb/1183.pdf>
- ⇒ Stern, A., Gochfeld, M., Weisel, C., & Burger, J. (2001). Mercury and methyl mercury exposure in the New Jersey pregnant population. Archives of Environmental Health, 56(1): 4-10.
- ⇒ Weir, E. (2001). Methylmercury exposure: fishing for answers. Canadian Medical Association Journal, 165(2): 205-206.