

Mercury: You are what you eat?

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Case 1

- 72 YOF
- Blood mercury 65 ug/l
- Retired school teacher
- Likes tuna



Mercury levels

- Blood- better for organic Hg, urine, ?hair
- Normal blood mercury < 10 ug/l, urine $< 20-50$ ug/l
- Action level: Blood > 35 , Urine >150
- WHO: nontoxic Hair Hg <10 ppm



Mercury

- Metallic mercury or quicksilver
- Dental amalgams or fillings
 - Used since Egyptian times
- **Occupational**
 - bronzers, dentist, electroplaters,
 - jewelers, photographers, dye makers
- 1800's Danbury shakes, Mad Hatters
- Mercury in fish

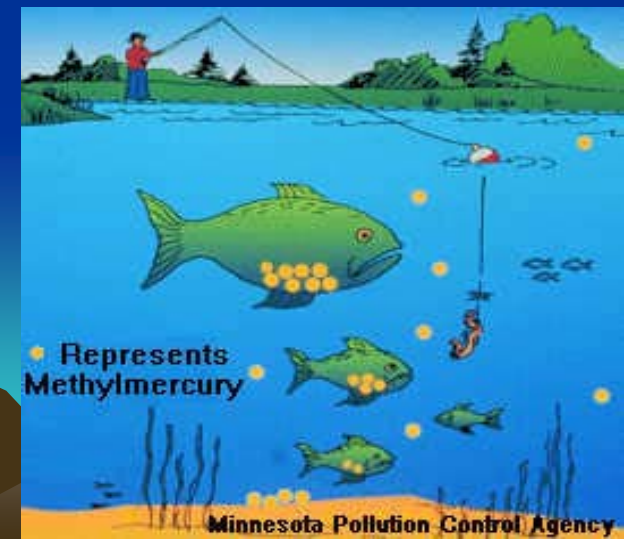


Case 2

- **Pregnant granddaughter advised to watch fish intake from lake**
- **Mercury fish advisory: don't eat fish more than 2 X week from this lake**
- **Blood Mercury 25 ug/l**
- **Weakness, trouble concentrating, memory loss**
- **Eaten fish from border lake 2-3 X a day for > 30 years**

Case 3

- **67 YOF with blood mercury of 14 ng/ml**
 - Memory loss
 - Lives 9 months in Florida, 3 months in Northern Minnesota, eats fish 4-6 meals/week
 - Salmon, crab, tuna, herring, walleye, fish oil



Mercury levels in High End Consumers of Fish

- Hightower JM, Moore, D. EHP 2003
- National Academic of Sciences recommends blood mercury < 5 ug/l
- N= 123
- 54% had blood mercury 10 ug/l or higher
 - Range 2-89.5 ug/l. Mean 13-15 ug/l



Mercury levels in High End Consumers of Fish

- Swordfish consumption had highest correlation with blood mercury
- Serial blood mercury levels in 67 subjects
 - Dropped rapidly within 3 weeks after being told not to eat fish or greatly reduce consumption fish with high levels of mercury
 - All dropped to < 5 ug/l within 41 weeks except 2 who continued to eat large predatory fish



Mercury

- General protoplasmic poison
- Binds to sulfhydryl groups
- Toxicity and clinical manifestations depends on form of mercury
- Half life?
 - Acute exposure: 2-4 days
 - Long term exposure: 30-90 days (average 60 days)



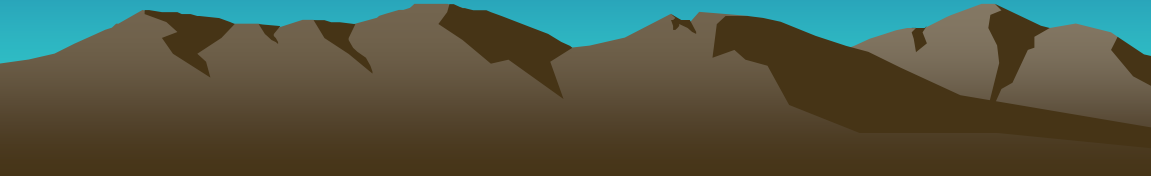
Mercury



- **Inorganic mercury- GI mucosa necrosis, ATN**
- **Elemental mercury:** Mercury thermometers, liquid at room temperature (Hg^0)
 - Dental amalgams or fillings
 - Inhalation exposure- 80% absorbed
 - Cough, metallic taste, chest tightness, chills, fever, weakness, GI upset, pneumonia. bronchitis
 - Triad = tremor, gingivitis, erethism
 - Mad Hatter- tremor, paresthesia, hyperexcitability, memory loss, erethism
 - Sensory neuropathy, renal disease

Organic Mercury

- Methyl mercury, ethyl mercury, others
- Well absorbed via GI tract, lipid soluble
- CNS: numbness, ataxia, tremor, constriction of visual fields, hearing loss, rigidity, spasticity
- Crosses placenta and excreted in breast milk



Dimethyl mercury

- 1997: Karen Wetterhahn
- Few drops on latex gloves
 - Permeable within 15 seconds
- 5 months later
 - Incoordination, ataxia, nausea, slurred speech
- Died 4 months later despite
 - chelation treatment
 - exchange transfusions



Organic Mercury

- Minamata Bay, Japan-
 - 1940s-1960s- at least 30 cases of prenatally exposed infants
 - Cerebral palsy like symptoms
 - Microencephaly, mental retardation, seizures
 - Ataxia, blindness
 - Attention span, memory
 - Kidney disease



Organic Mercury and Kids

- Oken, Bellinger, Curr Opin Pediatr 2008
 - Neurodevelopmental effects with high dose of mercury
 - Beneficial effects: n-3 fatty acids
 - Oken et al- EHP 2005
 - Best visual memory scores if mother consumed more than 2 servings of fish/week but had hair mercury level < 1.2 ug/g
- Axelrad et al, EHP 115(4):609-615
 - Analyzed prior data
 - -.18 IQ points per each 1 ppm increase in maternal hair mercury



Organic Mercury

- Faroe islands- Grandjean et al, Am J Epidemiol 1999
 - Whale meat, blubber
 - Cord blood, maternal hair
 - AER, Abn memory, attention, language up to age 7
- Seychelle islands, Meyers et al, Lancet 2003
 - 12 fish meals/week, average fish Hg content 0.3 ug/kg
 - Fish Hg content similar to U.S.
 - No abn.development or IQ up to age 66 months



Organic Mercury in Adults

- Decreased fine motor speed, dexterity, concentration, memory, verbal learning with high hair Hg concentrations- Env Health 2003- ?? LOEL
- Paresthesias if hair > 30-50 ppm, blood > 250-400 ng/ml -Neurotoxicity Research 2003



Mercury and MI

- **Eskimos** = low CAD, eat 400 g fish/day
- **Diet and Reinfarction Trial**- 29% decrease mortality in survivors of first MI who eat fish 2 X week for 2 years
- Mercury level in toenails correlated with fish consumption but there was no association between mercury levels and myocardial infarction – Yoshizawa et al, NEJM 2002
- Toenail mercury concentrations directly associated with risk of myocardial infarction- Guallar et al, NEJM 2002

Organic mercury treatment

- Remove from exposure
- Tell them to stop eating fish
- Check blood mercury every month
 - Usually falls to < 10 in 1-2 months
- Chelate if significant symptoms or ?Blood Hg > 40
 - BAL im injection if extremely ill
 - DMSA, 2-3-dimercaptosuccinic acid
 - DMPS- 2,3-dimercapto-1-propanesulphonate

Mercury Exposure and Chelation

- Risher JF, Amler SN, Neurotoxicology 2005
- Controlled studies lacking that prove chelation for mercury levels improves outcome
- DMSA- approved for pediatric Hg toxicity
 - Teratogenic/fetotoxic in pregnant rats
- DMPS- compounding pharmacy



Lead and Mercury Exposures: interpretation and action

- Brodtkin E et al, CMAJ 2007
- Refer for clinical management if blood level > 40 ug/l
- Investigate possible exposure if blood level > 10 ug/l

