Toxic Metals Evaluation and Treatment

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What are toxic metals

- **Arsenic**
- **Lead**
- **Mercury**
- Aluminum
- Cadmium
- Barium
- Tin
- Nickel
- Titanium
- Thallium
- Tungsten
- Uranium

Toxicity

2003 CERCLA Priority List of Hazardous Substances

1. **arsenic**
2. **lead**
3. **mercury**
4. **vinyl chloride**
5. **polychlorinated biphenyls (PCB)**
6. **benzene**
7. **cadmium**

Arsenic

- Found in Idaho ground water. Hypothesis: irrigation of desert soils cause leaching of minerals into ground water. Arsenic is one of these minerals.
- 95% of Idaho's drinking water comes from ground water.
- Counties with highest ground water concentrations: Elmore, Gem, Owyhee, Washington, Kootenai, Jefferson.
- EPA < 10 ppb, test every 3 years

Arsenic Sources

- Industry
  - Wood preservative
  - Pesticide, cattle/sheep dips
  - Herbicide
  - Rodenticide
  - Paint, dye, cosmetics
  - Metals (metallurgy, mine tailings)
  - Soap
  - Electronic manufacturing
  - Preserving animal hides
  - Cigarettes (1.4 µg/ cigarette inhaled smoke)

Arsenic in Food

- Soil contamination
  - Copper smelters/toxic waste sites
  - Fertilizers

Arsenic Health Affects

- The longer you are exposed, the greater the health risk.
- Cancer: skin, bladder, lung, prostate
- Skin changes: Hyperpigmentation, Hyperkeritinization, Mees Lines (white lines across nails)
- Affects all organ system: gastrointestinal (gastritis, nausea), cardiovascular (EKG abnormalities), neurological (mood, poor reflexes, hearing loss), hormonal (diabetes), musculoskeletal (weakness, pain), hemotological (anemia), nephrological (kidney insufficiency), reproductive (birth defects, infertility), pulmonary (fibrosis).
- Smoking increases risk of disease.

Arsenic – tissue effects

- Liver, kidney, spleen, lungs, gastrointestinal system
- Imbedded in skin, hair, nails, some in bones/ teeth
- Crosses placenta

Arsenic Evaluation

ATSDR guidelines:

- Hair arsenic > 1 mg/gm
- Urine arsenic > 50 µg/g/24 hr.
- Normal blood levels < 7 µg/dL

Lead – Concern for childhood safety

- Starts in womb: crosses placenta, increased risk miscarriage, preterm labor, low birthweight.
- First signs can be subtle
  - Adverse behavior seen in classroom and social interactions.
  - At blood levels 10-25 μg/dl, may appear asymptomatic, but with impaired abilities
    - Lower IQ, speech/hearing difficulties, lower verbal ability, early signs ADD/ADHD, irritability, occasional abdominal discomfort, fatigue, lethargy
- Lower income children at greater risk

Lead Sources - Ubiquitous

- House dust, paint prior 1973
- Dust from lead-contaminated soil
- Drinking water lead-pipes (plumbers)
- Soldering (stained glass manufacture)
- Bullet making, eating game killed with lead bullets
- Air borne emissions: smelters, battery manufacturers

Lead – Low Levels

- EPA, CDC < 10 μg/dl blood
- Decreased intelligence, reading/learning disabilities, impaired hearing, reduced attention span, hyperactivity, antisocial behavior

- EPA: '..no demonstrated safe concentration of lead in blood… health effects can occur at blood lead levels as low as 2.5 μg/dl.'

Lead In Adults

- Life time exposure
- Deposition into bones
  - Increased risk at menopause when bones decrease in density
- 2006 *Circulation*
  - > 2 μg/dl blood may help determine risk of heart attack, stroke, heart disease

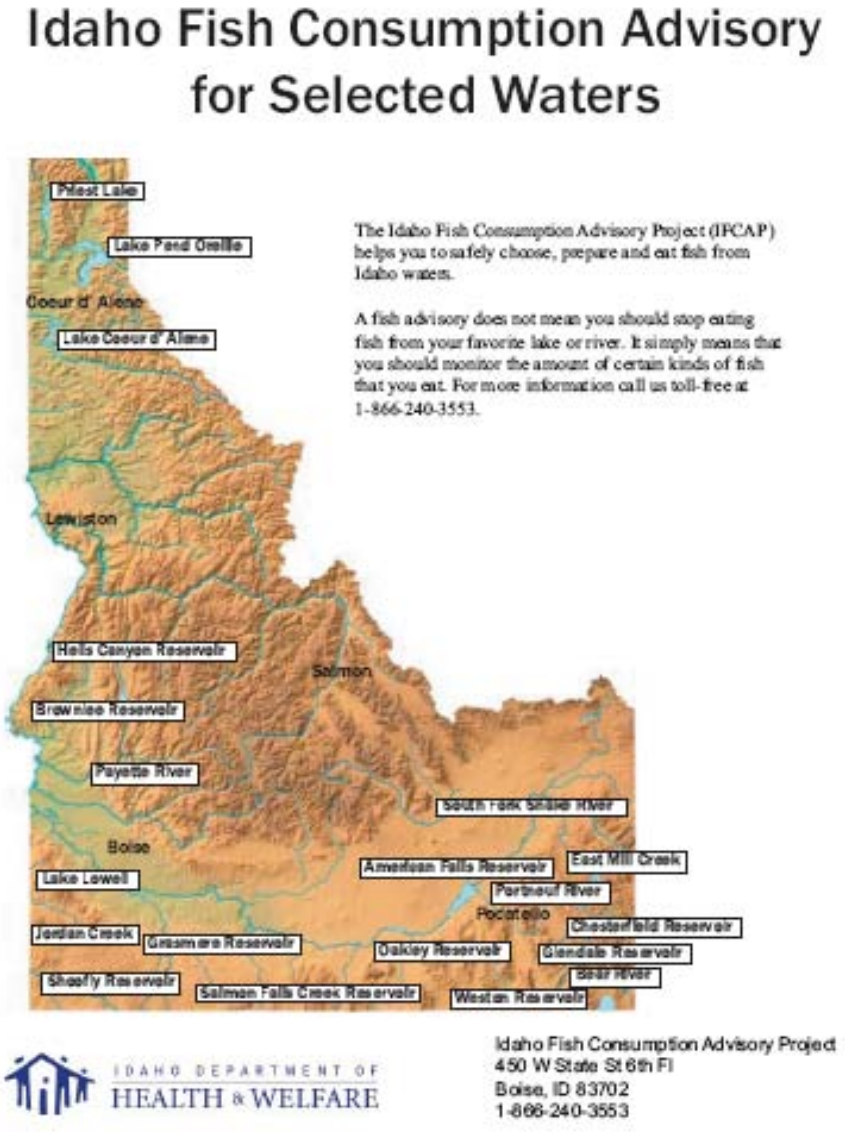
Mercury Sources - Ubiquitous

- Airborne
  - Coal-fired power plants (~100,000 lbs/year)
  - Municipal waste incinerators
  - Medical waste incinerators
  - Chlor-alkali plants
  - Forest Fires

Mercury Sources

- Food Sources
  - High fructose corn syrup -contamination from Chlor-alkali plants. Very easy for children to exceed daily mercury allowances.
  - Fishmeal-fed animals (i.e., poultry)
  - Fish, both ocean and fresh water sources
    - the bigger the fish, the more mercury accumulation
    - Tuna, sword fish, tilefish, shark, seabass, mackerel, marlin, farmed Atlantic salmon
  - Idaho fish: Pregnant women/children <15 years old, avoid Idaho bass more than twice monthly
  - Health and Welfare fish advisory

Fish Advisory Map



Mercury Sources

- Dental Amalgams
- Latex paint prior to 1990
- Light bulbs
- Thermometers
- Vaccinations (thimerosol still in adult vaccines)

Mercury Sources

Common House Hold Products	ppb Hg
Dove Soap	0.0027
Ivory Dishwashing Liquid	0.061
Ajax Powder	0.17
Comet Cleaner	0.15
Soft Cide Soap (Baxter)	8.1

- http://www.epa.gov/glnpo/bnsdocs/hgsbook/business.pdf

Long term Toxicity - Mercury

- ½ life
  - Blood: organic (methylmercury) 50-80 days, elemental 45 days
  - Brain: 20 years
- Can cross placenta, blood/brain border
  - A new born baby can have 30-200% increase compared to mother's blood
- Elemental mercury can vaporize – breathing 'ingestion'
- Critical target organs: brain, liver, kidney
  - Leads to decreased cognitive function, decreased detoxification ability, hypertension, cardiovascular disease/heart attacks

Organic Mercury

- Additive in commercial products for human use
- Can be absorbed by digestive system by bacteria - demethylation of methylmercury
- In the cell - oxidation of elemental mercury
- Does not cross blood brain barrier, but found in brain of neonates (blood brain barrier not fully formed until 6 mos of age).
- Kidney major area of accumulation
- Found in liver, spleen, bone marrow, red blood cells, intestine, lung wall

What does contamination look like

- Mercury in children whose mother had >24 ug/L blood, difficulties with:
  - learning, reading comprehension, fine motor skills, mild cerebal palsy, language skills
  - Mothers with 5-24 ug/L blood: more subtle responses, but correspondence to mother's level of exposure

What Mercury looks like

- General mercury exposure symptoms:
  - irritability
  - exaggerated response to stimulation
  - excessive shyness
  - insomnia
  - emotional instability
  - memory deficits, attention deficits, language problems
  - confusion
  - vasomotor instability (excessive perspiration, uncontrolled blushing)
  - Hearing loss, vision changes
  - tremors

Evaluation/Testing

- Elemental and inorganic mercury can not be found in hair samples
- If not a current exposure, then will not find in blood.
  - Blood ½ life of mercury 45-80 days
- Standard of care for chronic toxicity is provoked urine test.
- Fecal testing can be used in infants without provocation.

Mercury

- EPA reference
  - **< 0.1 µg/kg bodyweight/day**
  - **General guidelines for blood levels have not been established**

Evaluation/Physical Exam

- Physical Exam
  - Skin, nail changes
  - Mental acuity
  - Neurological deficits
  - Heart/Lung
- Blood work: blood mercury, kidney/liver function, blood count

Why are some people more affected than others?

- Genetics
- Nutrition
- Concomitant toxic exposures

Treatment

- Avoid toxic exposures
- Eat nutritious diet
- Eat fiber 30+gram/day (women), 38+ grams/ day (men)
- Chelation therapy
  - The treatment of using specific chemicals to remove toxic metals from the body
  - DMSA, DMPS, EDTA

Chelation Case Study

- 55 year old male fire fighter presents to clinic with Non Hodgkin's Lymphoma. Referred by his MD for Toxic Metal Chelation

Environmental Exposure History:

- Grew up near copper/lead smelter plant
- Down wind from Hanford Nuclear plant
- Logger x 20 years, chainsaw exhaust
- Truck driver for agriculture spraying/defoliation (2,4-D)
- Fireman x 17 years, at least one exposure to PVC fire
- Diagnosed Lymphoma 2009

URINE TOXIC METALS

DOCTOR'S DATA inc

Initial toxic metal burden: 14 metals

Lead & Mercury very high. Uranium high.

POTENTIALLY TOXIC METALS

METALS	RESULT µg/g creat	REFERENCE RANGE	WITHIN REFERENCE RANGE / ELEVATED / VERY ELEVATED
Aluminum	7.7	< 25	
Antimony	0.1	< 0.3	
Arsenic	18	< 108	
Barium	1.1	< 7	
Beryllium	< dl	< 0.5	
Bismuth	< dl	< 10	
Cadmium	0.4	< 0.8	
Cesium	8	< 9	
Gadolinium	0.2	< 0.3	
Lead	24	< 2	
Mercury	15	< 3	
Nickel	2.4	< 10	
Palladium	< dl	< 0.3	
Platinum	< dl	< 1	
Tellurium	< dl	< 0.3	
Thallium	0.3	< 0.5	
Thorium	< dl	< 0.03	
Tin	1.2	< 9	
Titanium	< dl	< 15	
Tungsten	0.1	< 0.4	
Uranium	0.2	< 0.03	

Protocol

- Chelation with DMSA/EDTA
- Detoxification multivitamin
- Magnesium
- Vitamin C
- Protein Powder
- Fiber
- N-Acetyl cysteine
- Colonics, Sauna

URINE TOXIC METALS

DOCTOR'S DATA INC

May 2010, after 10 weeks chelation:

May 2010: 13 metals. Lead, Mercury decreased.

POTENTIALLY TOXIC METALS

METALS	RESULT µg/g creat	REFERENCE RANGE	WITHIN REFERENCE RANGE / ELEVATED / VERY ELEVATED
Aluminum	9.2	< 25	
Antimony	0.05	< 0.3	
Arsenic	34	< 108	
Barium	1.7	< 7	
Beryllium	< dl	< 0.5	
Bismuth	< dl	< 10	
Cadmium	0.5	< 0.8	
Cesium	10	< 9	
Gadolinium	< dl	< 0.3	
Lead	13	< 2	
Mercury	6	< 3	
Nickel	3.7	< 10	
Palladium	< dl	< 0.3	
Platinum	< dl	< 1	
Tellurium	< dl	< 0.3	
Thallium	0.6	< 0.5	
Thorium	< dl	< 0.03	
Tin	0.7	< 9	
Titanium	N/A	< 15	
Tungsten	0.07	< 0.4	
Uranium	0.2	< 0.03	

URINE TOXIC METALS

December 2010: 11 metals. Lead, mercury significantly decreased.

DOCTOR'S DATA INC

POTENTIALLY TOXIC METALS

METALS	RESULT µg/g creat (7/30/10)	REFERENCE RANGE	WITHIN REFERENCE RANGE	ELEVATED	VERY ELEVATED
Aluminum	6.8 (7.9)	< 25			
Antimony	< dl	< 0.3			
Arsenic	13 (35)	< 108			
Barium	2 (2.5)	< 7			
Beryllium	< dl	< 0.5			
Bismuth	< dl	< 10			
Cadmium	0.6 (0.5)	< 0.8			
Cesium	4.8 (8.6)	< 9			
Gadolinium	< dl	< 0.3			
Lead	6.4 (9.1)	< 2			
Mercury	2.1 (1.4)	< 3			
Nickel	1.8 (3.4)	< 10			
Palladium	< dl	< 0.3			
Platinum	< dl	< 1			
Tellurium	< dl	< 0.3			
Thallium	0.3 (0.3)	< 0.5			
Thorium	< dl	< 0.03			
Tin	0.4 (0.7)	< 9			
Titanium	N/A	< 15			
Tungsten	0.2 (0.1)	< 0.4			
Uranium	< dl	< 0.03			

Heavy Metal Toxicity Scale

Symptoms:		date 4/1/10	date	date 8-17-10	date
1.	Unexplained irritability	3	3	2	
2.	Constant or very frequent periods of depression	0	0	0	
3.	Numbness and tingling in extremities	1	0	0	
4.	Frequent urination during the night	10	10	10	
5.	Unexplained chronic fatigue	3	1	0	
6.	Cold hands and feet, even in moderate weather	0	0	0	
7.	Bloated feeling	3	1	0	
8.	Poor memory or Brain fog	5	3	2	
9.	Sudden, unexplained anger	3	2	1	
10.	Constipation	0	0	0	
11.	Difficulty making decisions	1	1	0	
12.	Tremors or shakes of hands, feet, head, etc.	0	0	0	
13.	Muscle twitches	2	1	0	
14.	Frequent leg cramps	4	1	1	
15.	Ringing in ears	0	0	0	
16.	Get out of breath easily	2	1	0	
17.	Heartburn	0	0	0	
18.	Excessive itching	1	0	0	
19.	Unexplained rashes, skin irritation	0	0	0	
20.	Metallic taste in mouth	1	0	0	
21.	Jumpy, Jittery, Nervous	0	0	0	
22.	Suicidal thoughts	0	0	0	
23.	Insomnia	1	0	0	
24.	Unexplained chest pains	0	0	0	
25.	Constant or frequent pain in joints	3	1	1	
26.	Rapid heart rate	1	0	0	
27.	Unexplained fluid retention	0	0	0	
28.	Burning sensation on the tongue	0	0	0	
29.	Headaches after eating	0	0	0	
30.	Frequent diarrhea	0	0	0	
Total:		44	25	17	

Adopted from: Huggins, HA, It's All in Your Head, Avery Publishing Group, NY, 1993, pg. 54.

April 2010: 44

June 2010: 25

August 2010: 17

Improvement:

Irritability, anger

- Fatigue
- Brain fog
- Numbness/tingling
- Leg cramps, muscle twitches
- Itching
- Bloated feeling
- Metallic taste
- Joint pain
- Insomnia
- Shortness of breath

Patients Comments

- “I had chronic fatigue, slept at all times throughout the day, didn’t sleep well at night & and general feeling of malaise.
- “The detox program I’m involved in has turned things around - I don’t sleep all the time, sleep much better at night , no chronic fatigue, and I feel more energized than I have in years.
- “I consider myself a minor success story in this approach to health and well being and feel I owe it to the detox program”

Summary

- Toxic metals are part of the environment
- Children are at highest risk
- Knowing how to avoid toxicity is imperative
- Testing is available
- Guided detoxification is available
- There are no known safe levels for toxic metals.

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