Heavy Metals and Common Health Conditions: Evaluation, Testing and Treatment

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2019 Rank	Substance Name
1	ARSENIC
2	LEAD
3	MERCURY
4	VINYL CHLORIDE
5	POLYCHLORINATED BIPHENYLS
6	BENZENE
7	CADMIUM
8	BENZO(A)PYRENE
9	POLYCYCLIC AROMATIC HYDROCARBONS
10	BENZO(B)FLUORANTHENE
11	CHLOROFORM
12	AROCLOR 1260

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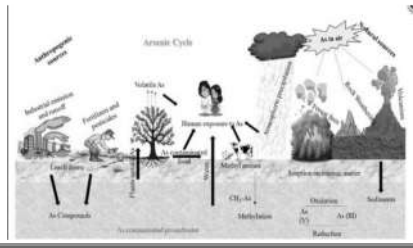

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Arsenic

Sources

- Chromated copper arsenate (CCA) used as a preservative in wood products
  - Previously been used in decks, playsets, and playgrounds-dermal exposure
- Inorganic arsenic used in pesticides for agricultural applications- run-off in water
- - then accumulates up the food chain
- **Occupational**
  - Copper or lead smelting
  - Wood treatment
  - Pesticide application
  - Glass manufacturing plants

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. ToxGuide for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Arsenic

Sources
- **Food**
  - Organic As in fish and shellfish
  - Organic and Inorganic As in rice and chicken
  - Round-up residue
- **Drinking water**
  - Inorganic
  - Limit is 10 ppb
  - Higher than 20 ppb have increased risk of bladder and lung cancer
  - 2% of US drinking water supplies exceed 20 ppb of arsenic

- Agency for Toxic Substances and Disease Registry (ATSDR). 2007. ToxGuide for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Arsenic

Chronic Toxicity – Inorganic
- Headache
- Fatigue
- Confusion
- Numbness and tingling in extremities
- Hearing loss
- HTN
- CVD
- Skin rash-dermatosis

- Agency for Toxic Substances and Disease Registry (ATSDR). 2007. ToxGuide for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Arsenic

Cardiotoxicity
- Long-term exposure to low to moderate arsenic levels was associated with cardiovascular disease incidence and mortality (<5.8μg/g)
- Plasma total homocysteine was positively correlated with %MMA in urine and with water arsenic concentration
- Association between arsenic and high blood pressure at well water concentrations of 10–40 ppb

- Agency for Toxic Substances and Disease Registry (ATSDR). 2007. ToxGuide for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Arsenic

Carcinogenicity

- inorganic arsenic can increase the risk of **skin, bladder**, **lungs**, and **liver cancer**
- **Bladder Cancer**
  - Drinking-water exposure concentration at about 100–150 µg/L increases the risk of cancer
- **Lung Cancer**
  - Squamous cell carcinomas (SqCC) and small cell carcinomas (SCC)
  - Association with high dose arsenic in drinking water in general population
  - Association of inhaled arsenic in occupational cohorts
  - Agency for Toxic Substances and Disease Registry (ATSDR). 2007. ToxGuide for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Arsenic

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M.V. Gamble, X. Liu, H. Ahsan, R. Pilsner, V. Ilievski, V.Slavkovich, F. Parvez, D. Levy, P.Factor-Litvak, J.H. GrazianoFolate, homocysteine, and arsenic metabolism in arsenic-exposed individuals in Bangladesh. Environ. Health Perspect. 2005;113:1683–1688

C. Hopenhayn-Rich, M.L. Biggs, D.A. Kalman, L.E. Moore, A.H. SmithArsenic methylation patterns before and after changing from high to lower concentrations of arsenic in drinking water

Environ. Health Perspect. 1996;104:1200-1207

Chen Y,et al. A prospective study of arsenic exposure, arsenic methylation capacity, and risk of cardiovascular disease in Bangladesh. Environ Health Perspect 2013;121(7):832-838

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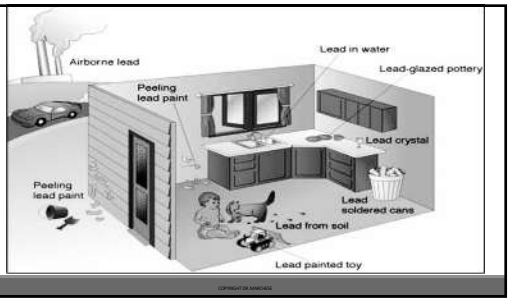

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Lead

Exposure Sources
- Some types of hair dyes and cosmetics like lipstick may contain lead compounds
  - EWG.org
- Hobbies
  - Casting ammunition and fishing weights; soldering with lead solder; making stained glass; using firing ranges
  - Leaded gasoline is still used in some race cars, airplanes, and off-road vehicles
- Some non-Western folk remedies may contain substantial amounts of lead
  - Most commonly from India, China, and other parts of Asia

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Lead

Neurotoxicity
- Most common neurological symptom of lead exposure in **adults** is **peripheral neuropathy**
- Affects all neurotransmitters in the brain (dopaminergic, cholinergic and glutaminergic systems)
- Increased incidence of Parkinson Disease alzheimers, and MS

Neurotoxicity (Prenatal / Childhood)
- Crosses BBB and infers with formation of BBB
- Increased incidence of ADHD and Autism
- Inverse relationship between IQ and average lifetime blood lead

Neurotoxicity (Prenatal / Childhood)
- Directly associated with reading disabilities, disturbances in fine motor function, poorer reading scores, failure to graduate from high school, and lower exam scores up to a mean age of 18.7 years
- Correlation noted at levels as low as 2.5µg/dL

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Lead

Renal Toxicity
- Lead nephropathy has been well documented in occupationally exposed workers
- Causes proximal tubular damage, glomerular sclerosis, and interstitial fibrosis
- Results in proteinuria, impaired transport of glucose and organic anions, and lowered glomerular filtration rate (GFR)

Cardiotoxicity
- Increases in all-cause circulatory and cardiovascular mortality
- Increased incidence of **hypertension**, cerebrovascular disease, and cardiovascular disease

Other Health Effects
- Interferes with active Vitamin D conversion
- Increased frequency of still-births, miscarriages, and spontaneous abortion, reduced sperm counts and motility, decreased fertility, hypospermia, increased rates of teratospermia, and decreased libido
- Probable human carcinogen – International Agency for Research on Cancer (IARC)

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Lead

Common conditions

PCOS

Endometriosis

Osteoporosis

HTN

Infertility

Miscarriage

Adult ADD

M.Marchese. 8 Weeks to Women's Wellness. 2011. Smart Publ Petaluma CA.

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Lead

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Patrick, L. Lead Toxicity, A Review of the Literature. Part I: Exposure, Evaluation, and Treatment. AMR. 2006;11(1):2-22

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https://www.cdc.gov/niosh/topics/lead/health.html#:~:text=Exposure%20to%20high%20levels%20of,a%20developing%20baby%27s%20nervous%20system.

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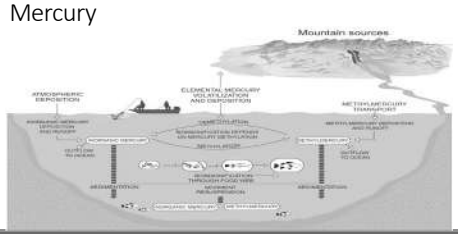
Mercury



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Elemental

Elemental Mercury
- Found in thermometers, thermostats, fluorescent bulbs, dental amalgam fillings, latex paints
- Eventually enters vapor state
- Lipophilic, accumulates in brain and kidney

Exposure Sources
- Dental amalgams
- Inhalation of mercury vapors in ambient air
- Latex paint (prior to 1991)
- Individuals who live in proximity to former mercury industries
- Largest single source is coal burning power plants (not regulated by EPA)

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Inorganic

Inorganic mercury
- Mercury salts
- Found in cosmetic products, laxatives, teething powders, diuretics, and antiseptics
- Formed from the metabolism of elemental mercury vapor or methylmercury

Exposure Sources
- Skin ointments to treat skin infection
- Antiseptic preservative, laxatives
- Treatment of skin sores from syphilis (developing countries)
- Teething powders as calomel
- Formed by demethylation of methylmercury in gut and oxidation of elemental mercury intracellularly

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Organic

Organic mercury
- Most toxic and the Most common exposure
- **Methylmercury** found in fish, poultry that has been fed fishmeal
- **Ethylmercury** found in in some vaccine preservatives and some antiseptics (not in vaccines anymore)
- **Phenylmercuric acetate** (PMA) formerly used in some indoor paint (discontinued in 1991)
- Bioaccumulates in tissues
- Formed from the conversion of inorganic or elemental mercury in living organisms
- May be found in water and soil as the result of the methylation of elemental and inorganic mercury by microorganisms

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Organic mercury

Methylmercury
- **Exposure Sources**
  - Bioaccumulates in the food chain, particularly in fish
    - Absorbed as water passes over gills or eating of aquatic organism
    - ½ life in fish is 2 years
  - Found in fresh or salt water fish
  - Poultry fed fish meal

Ethylmercury
- Generated in the body after metabolism of thimerosal
- Renal and central nervous system toxicity
- **Exposure**: Vaccinations in the past- no longer in vaccines except possibly flu

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Mercury

Neurotoxicity
- Impairment of the peripheral vision
- Disturbances in sensations ("pins and needles")
- Lack of coordination of movements
- Impairment of speech, hearing, walking
- Muscle weakness
- MS, Parkinson's disease, alzheimers

Cardiotoxicity
- **Increase risk for cardiovascular disease**
  - Increased risk for acute myocardial infarction with intake of nonfatty freshwater fish
  - Prenatal maternal intake correlated with significant BP elevations in 7 year old

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Mercury

Nephrotoxicity – Inorganic Mercury
- **Nephrotic Syndrome**
  - Results in proteinuria
  - Cases seen in infants from teething powder and adults from skin lightening creams

Immunotoxicity
- **Autoimmunity**
  - Positive associations between elevated elemental mercury exposure and up-regulated serum titers of autoantibodies

Endocrine Toxicity
- **Thyroid**
  - Prenatal and postnatal mercury exposure was inversely associated with TT4, TT3, and FT3 levels

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Mercury

Prenatal Health Effects

- 16% of all women of childbearing age carry mercury body burdens that create risks for children born with neurological deficits
- Adverse effects were observed between environmental inorganic or organic mercury prenatal and early infancy exposures and ASD and ADHD
- Linear relationship with mercury levels and IQ deficit
- Safe limit of mercury cannot be calculated

Yoshimasu K, et al. A meta-analysis of the evidence on the impact of prenatal and early infancy exposures to mercury on autism and attention deficit/hyperactivity disorder in the childhood. Neurotoxicology. 2014 Sep;44:121-31.

Kern JK, et al. Evidence of parallels between mercury intoxication and the brain pathology in autism.

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Soon TD, Lindow SW. Mercury exposure in pregnancy: a review. J Perinat Med. 2014 Nov;42(6):721-9.

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National Research Council. *Toxicological Effects of Methylmercury*. Washington, DC: National Academy Press; 2000:33-35.

Clarkson TW. The three modern faces of mercury. *Environ Health Perspect* 2002;110:11-23.
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Aminzadeh KK, Etminan M. Dental amalgam and multiple sclerosis: a systematic review and meta-analysis. J Public Health Dent. 2007 Winter;67(1):64-6.

Mutter J, Curth A, Naumann J, Deth R, Walach H. Does inorganic mercury play a role in Alzheimer's disease? A systematic review and an integrated molecular mechanism. J Alzheimers Dis. 2010;22(2):357-74.

Gerhardsson L, Lundh T, Minthon L, Londos E. Metal concentrations in plasma and cerebrospinal fluid in patients with Alzheimer's disease. Dement Geriatr Cogn Disord. 2008;25(6):508-15.

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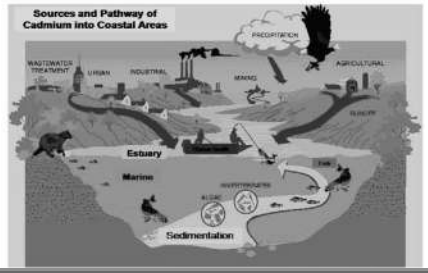

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Cadmium

Exposure Sources

- **General Population**
  - **Food**
    - Introduced into food chain through agricultural soils
    - Cadmium-plated utensils and equipment used in processing
    - Enamel and pottery glazes with cadmium-based pigment
    - Stabilizers used in food contact plastics
    - Highest in leafy vegetables, potatoes, grains, peanuts, sunflower seeds, organ meats
  - **Cigarette smoke-** indoor and outdoor air pollution

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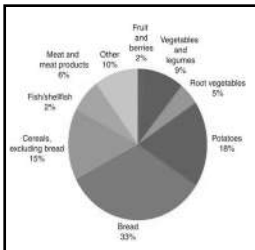

The food groups that contributed most to Cd intake were cereals and bread (34%), leafy vegetables (20%), potatoes (11%), legumes and nuts (7%), and stem/root vegetables (6%).

Lettuce was the major Cd source for Caucasians and Blacks, whereas tortillas were the top source for Hispanics, and rice was the top contributor among other ethnic subgroups including Asians.

Kim K, et al. Dietary Cadmium Intake and Sources in the US. *Nutrients*. 2018;11(1):2. Published 2018 Dec 20.

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Dietary cadmium and health

Chronic kidney disease

HTN

Osteoporosis

Diabetes

Atherosclerosis

Increase risk gastric cancer

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Cadmium

Kidney Toxicity

- Renal tubular damage leads to osteoporosis and osteomalacia
  - Inverse relationship between urinary cadmium and vitamin D levels
- Can lead to decreased GFR and kidney failure

- The International Agency for Research on Cancer (IARC) of the World Health Organization considered that
  - sufficient evidence of carcinogenicity of cadmium and cadmium compounds in humans due to **occupational exposure through inhalation**, and classified them as "carcinogenic to human" (Group 1 agents)

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Cadmium

Int J Cancer. 2019 May 1;144(9):2133-2160. doi: 10.1002/ijc.32039. Epub 2019 Jan 11.

Dietary cadmium and risk of breast cancer subtypes defined by hormone receptor status: A prospective cohort study

Sara Grioni [1], Claudia Agnoli [1], Vittorio Krogh [2], Valeria Pala [3], Sabina Rinaldi [4], Marco Vinceti [3,4], Paolo Contiero [5], Luciano Vescovi [6], Marcella Malavolti [3], Sabina Sieri [1]

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Cadmium

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. ToxGuide for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Satarug S. Dietary Cadmium Intake and Its Effects on Kidneys. *Toxics*. 2018;6(1):15. Published 2018 Mar 10. doi:10.3390/toxics6010015

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Thallium

Thallium is a metal found in soil and some minerals. Used to make certain medical agents and electronics. In the past, thallium was used in rodent killers and hair removal products.

exposed to thallium from coal-burning and smelting processes. The tiny particles can be inhaled from the air.

Consumed in food or drink. In the water and soil.

Cardiovascular (Heart and Blood Vessels), Hepatic (Liver), Neurological (Nervous System), Renal (Urinary System or Kidneys), Respiratory (From the Nose to the Lungs)

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Endometriosis

Study analyzed serum and urinary levels of **lead and cadmium** among patients suffering from endometriosis and age-matched controls.

Blood cadmium levels and urinary lead levels where higher in women with severe endometriosis compared to controls.

Schiattarella a, et al. Italian Journal of Gynaecology and Obstetrics 2011;47-52 - January 2018

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Endometriosis

Data from the National Health and Nutrition Examination Survey, 1999-2002.

- Whole **blood cadmium** linked to endometriosis

A 2017 study of 190 women at Taipei Medical University Hospital from 2008-2010: 68 with and 122 without endometriosis.

- **Blood lead** levels were higher and zinc lower in women with endometrioses. More direct lead exposure in Taipei?

Wu PY, et al. Int J Med Sci. 2018 Mar;15(3):279-87.
Reprod Toxicol. 2017 Dec;74:77-84.

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Thyroid

Associations between positive thyroid autoantibodies and blood mercury in women were evaluated using the National Health and Nutrition Examination Survey (NHANES), 2007-2008.

Women with **mercury** >1.81 µg/L positive association with Thyroglobulin AB

Gallagher CM, Meliker JR Environ Int. 2012 Apr;40:39-43.

Arsenic, lead and cadmium alter thyroid function

Sun H-L, et al. Environ Int. 2016 Oct;95:61-8

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Fibroids

2017 study showed **cadmium** but not lead or mercury linked to fibroids. Blood levels

NHANES 1999-2002,found link between fibroids and blood **lead** and **mercury**

Ye S, et al. Ann Occup Environ Med. 2017 Jun 22;29:22

Jackson LW,et al. *Human Reproduction*, Volume 23, Issue 3, March 2008, Pages 679–687,

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Immunotoxicity

Mercury- increased ANA, reduces B-cells and T-helper cells, Mitochondrial damage, Glutathione depletion in immune cells, Oxidative stress, hypermethylation of leukocytes.

Triggers many conditions- **MS, asthma, allergies, thyroid, lupus, autoimmune hepatitis, scleroderma, low lymphocyte subsets, myalgias**

Rooney JP, Gilbert KM. Curr Opin Toxicol. 2018 Aug; 10: 74–80.

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Immunotoxicity

Mercury-Increase serum immunoglobulin levels and antibody responses to T cell–dependent and T cell–independent antigens and worsening of autoimmune disease.

Increased production of the proinflammatory cytokines, tumour necrosis factor–alpha (TNF-α), IL-1β and IL-6, and production of reactive oxygen intermediates and increased eosinophil degranulation.

WHO Library Cataloguing-in-Publication Data. Guidance for immunotoxicity risk assessment for chemicals. 2012. Accessed online http://www.inchem.org/documents/pharm/pharmpubs/harmonization.pdf

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Fertility Women

Concentrations of **lead and Arsenic**, were significantly higher in the blood of infertile women than in that of pregnant women.

Cadmium in women = longer TTP

Mercury from fish = low birth weight babies and preterm birth

LEI HL, et al. BMC Public Health.. 2015 Dec 9;15(1):1220.

Buck Louis GM, et al. Fertil Steril. 2012 Jun;97(1):1201-7

Burch JB, et al. Int J Health Geogr. 2014 Aug 15;13:30

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Fertility-Men and Women

157 couples with infertility had higher blood **Mercury** levels than control group, associated with higher dietary fish intake.

Higher seafood consumption is associated with higher blood **mercury** levels in couples with infertility

AJOG 2002;109:1121-1125.-157

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Fertility- Men

Lead decreased sperm density, counts, motile, and viable sperm and increased abnormal morphology

Blood **cadmium** contributed to a decrease in sperm motility and an increase in abnormal sperm morphology

Lead levels in men linked to longer TTP

links with **lead and cadmium** and reduced sperm count motility, viability, and morphology.

Human Reproduction, vol. 22, no. 3, pp. 688–695, 2007.

Wijesekara GU, et al. Ceylon Med J. 2015 Jun;60(2):52-6.

Environmental Health Perspectives, vol. 108, no. 1, pp. 45–53, 2000.

Buck Louis GM, et al. Fertil Steril. 2012 Jul;97(5):1205-7

Environmental Health Perspectives, vol. 117, no. 6, pp. 933–927, 2009

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PCOS

- This study found **cadmium and mercury** elevated in women with PCOS or signs of PCOS who all had infertility
- **Cadmium** linked to higher AMH levels and insulin resistance in women with PCOS than controls.
- **Copper** levels were found to be higher in women with PCOS than in controls

Lee YM, et al. Ann Occup Environ Med. 2018 Jul 9;30:44

Behani M, et al. Toxicol Appl Pharmacol. 2016 Dec 15;313:119-130

Spritzer PM, et al. Biol Trace Elem Res. 2017 Feb;175(2):254-262

Gerhard I, et al. *J Toxicol Environ Health A*. 1998 Aug 21;54(8):593-611. (LO6 B)

Merlo E, et al. Toxicol Lett. 2019 May 7;312:45-54.

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Metal testing

Arsenic-urine

Lead- blood

Mercury- methyl mercury in blood, other forms blood and urine

Cadmium- urine

Urine is un-provoked either spot urine or 24-hour

No reference ranges for provoked urine

Very few studies using provoked urine

DO NOT use a provoked urine test to justify treatment or chelation

https://www.cdc.gov/exposurereport/biomonitoring_articles.html

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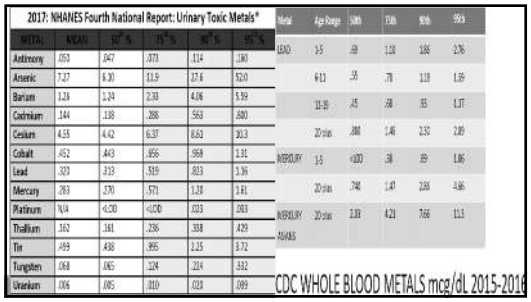

2017: NHANES Fourth National Report: Urinary Toxic Metals*

METAL	MEAN	50th %	75th %	90th %	95th %
Antimony	.059	.047	.073	.114	.180
Arsenic	7.27	6.30	11.9	27.6	52.0
Barium	1.26	1.24	2.38	4.06	5.59
Cadmium	.144	.138	.286	.563	.880
Cesium	4.55	4.42	6.37	8.63	10.3
Cobalt	.452	.443	.856	.568	1.31
Lead	.533	.513	.519	.813	1.36
Mercury	.263	.270	.571	1.28	1.81
Platinum	N/A	<LOD	<LOD	.023	.083
Thallium	.162	.161	.236	.318	.429
Tin	.469	.438	.995	2.25	3.72
Tungsten	.068	.065	.124	.224	.332
Uranium	.006	.005	.010	.023	.039

Metal	Age Range	50th	75th	90th	95th
LEAD	1-5	.59	1.15	1.88	2.76
	6-11	.55	.71	1.13	1.59
	12-19	.45	.68	.93	1.37
	20 plus	.088	1.46	2.32	2.89
MERCURY	1-5	<LOD	.58	.89	1.86
	20 plus	.748	1.45	2.86	4.46
MERCURY ASIANS	20 plus	2.83	4.23	7.66	11.3

CDC WHOLE BLOOD METALS mcg/dL 2015-2016

Testing-references

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2. MN Department of Health. Heavy metal detection and the concept of chelation. http://www.health.state.mn.us/divs/eh/hazardous/topics/chelatedoctor.pdf accessed 9/25/2015
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4. Marchese M. Provocative heavy metal testing; which chelator is best? *Townsend Letter*. 2011;Jan;89-91.
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Avoidance- metals

Mercury- fish, vaccines, amalgams, air pollution, thermometers.

Cadmium- smoking, air pollution, contaminated soil- vegetables, fertilizer, pesticides. FOOD and Cigarette smoke!

Lead- water, air pollution, hobbies, cosmetics, personal care products, paint, pesticides, can food.

Arsenic- air, water, soil, food, pesticides, seafood (organic form), wood preservative, glass/copper smelters, coal combusting.

Persist in the air, water, soil and move up the food chain!!

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Treatment need additional training, certification and malpractice coverage

[redacted] oral 5-10mg/kg/day in 3 divided doses every 6-8 hours 3 days on/11 days off

IV- 2.5-3/kg/day once a week as a push or fast drip- several reported reaction and SE

[redacted] oral 10-30mg/kg a day in 3 divided doses every 6-8 hours 3 days on/11days off. Up to 2,000mg a day max

[redacted] IV- 50mg/kg/day maximum dose 3 grams. As a push or fast drip but very hyperosmolar Once a week as a drip

These are generalized dosages but require additional training and certification to assess for side effects, interaction, liver and kidney damage. Do not take this information and attempt chelation.

Environmental exposure history, Testing, Avoidance education always come first

Assess kidney and liver function is important, some patients are not candidates for chelation

Treatment with chelation and support for mobilization and bio-transformation

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Which chelator?

Arsenic -DMPS/DMSA,

Methylation support (methylfolate, B12, trimethylglycine, SAMe)

Cadmium -EDTA/DMSA (DMSA binds Cd if urine pH is 7.5 or above)

Glutathione and alpha-lipoic acid protect against Cd-induced renal tubular damage (PMID: 23009295)

Lead- EDTA/DMSA

Glutathione support, ALA

Mercury- DMSA/DMPS

Glutathione support, ALA

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Treatment

Sauna therapy

Colon hydrotherapy

Supplementation with a chelator

- Think about the nutrients that are important for **biotransformation**!
- Cofactors and EDC clearance
  - MVM cofactor support
  - Liver support
  - DIM, Calcium-d-glucarate, ALA, NAC,

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Case fibromyalgia

A 42 year old female PTC in 2019 with diagnosis of fibromyalgia and complaints of; fatigue, muscle pain and a sense of being inflamed.

She had graves disease years ago and thyroid gland was ablated

She had complete hysterectomy age 39 for AUB

Medications; BiEst cream 2.5mg and testosterone cream 0.75mg, Levothyroxine 75mg

Supplements; lavender oil, magnesium, methyl B12, vitamin-D3, iron, nattokinase, stress formula and thyroid support formula from the store

Allergies; sulpha drugs, cipro, penicillin, morphine, grasses, tress, flowers, and lots of foods like dairy, eggs, peanuts and gluten.

Vitals and physical exam- WNL

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Case fibromyalgia

Initial labs done by another doctor two weeks prior to appointment with me;

CBC, CMP, TSH, HgA1C, lipids, Iron, ferritin, testosterone, estradiol, progesterone, GGT, CK, DHEA, cortisol, TPO Ab, thyroglobulin Ab, ANA, CMV, EBV all WNL and appropriate for medication dosages.

Environmental exposure history;

Mother had Lyme disease and active EBV in the past and positive for MTHFR mutation

Sister has Hashimotos disease and takes medication

In-utero and childhood exposures minimal based on geography and scorecard.org data

No significant exposures from living environment over the years, occupation, hobbies

Two years ago got breast implants and thinks her symptoms started then

Diet- lots of fish (tuna)

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Case fibromyalgia

My labs ordered august 2019

Blood mercury 16 and ESR 22

Patient didn't want to do chelation because she decided to get implants removed

We started avoidance of all fish and detoxification supplements with sauna therapy

1. Supplement to provide co-factors for liver phase one and two metabolism- six a day LOE B
2. Liver herbs- 2 a day LOE B
   - Included milk thistle, beet root, burdock root, dandelion root and artichoke leaf (200mg of each)
3. NAC 600mg a day LOE B

Sauna therapy 1-2 times a week for 8-10 weeks

- 7-10 minutes in the heat then 30 second cold shower, repeat 5-6 times and end on cold. LOE C
- [redacted]

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Case fibromyalgia

She had implants removed and started on her own turmeric

Repeat labs Dec 2019

Mercury lowered to 6 and ESR to 13

Repeat mercury Jan 2020 mercury lowered to 3

Symptoms;

fatigue, muscle pain, and sense of being inflamed is better but not completely gone.

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Case-hypothyroidism

A 34-year-old woman was referred for evaluation of a heavy metal test result that was done by another doctor.

The patient had hypothyroidism, fatigue, weight gain and her left eye brow and eye lash recently turned blond. She is perimenopausal with regular cycles.

Medications: Naturthroid one grain

Lab: TSH 3.92, Negative thyroglobulin AB and TPO-AB, CBC, CMP, Lipid, vitamin-D, iodine, iron, B12 all normal. DHEA, cortisol, E2, testosterone normal

Medical history, PMHX and FMHX unremarkable

Environmental hx: exposure growing up in Chicago near factories and plants. She swam as a child in a local lake that was close to these factories. Both her parents worked in a machine shop but she had no occupational or lifestyle exposures other than everyday living. She grew up drinking unfiltered tap water which was later deemed to have high lead content due to an investigative report.

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Case-hypothyroidism

Patient presented with test results in hand: another doctor ordered an unprovoked first morning urine metal test

- aluminum 39, cadmium 0.7, cesium 12, mercury 1.3, lead 0.4, and nickel 7.2.

A provoked urine test using a body weight dose of DMSA was done the same day as the unprovoked urine collection

- aluminum at 4.5, cesium 9.5, lead 6.8, and mercury 9.0.
- There are no reference ranges for this type of testing
- The choice of the chelator reflects chelation of lead and mercury on the second urine test (provoked)

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Toxic Metals; Urine

		RESULT early recall	REFERENCE INTERVAL
Aluminum	(Al)	39	< 35
Antimony	(Sb)	< dl	< 0.6
Arsenic	(As)	12	< 119
Barium	(Ba)	4.1	< 7
Beryllium	(Be)	< dl	< 1
Bismuth	(Bi)	0.1	< 15
Cadmium	(Cd)	0.7	< 1
Cesium	(Cs)	12	< 14
Gadolinium	(Gd)	< dl	< 0.4
Lead	(Pb)	0.4	< 2
Mercury	(Hg)	1.3	< 4
Nickel	(Ni)	7.2	< 10
Palladium	(Pd)	< dl	< 0.3
Platinum	(Pt)	< dl	< 1
Tellurium	(Te)	< dl	< 0.8
Thallium	(Tl)	0.3	< 0.9
Thorium	(Th)	< dl	< 0.09
Tin	(Sn)	0.3	< 30
Tungsten	(W)	0.2	< 0.6
Uranium	(U)	< dl	< 0.04

	RESULT early recall	REFERENCE INTERVAL
CREATININE, URINE		

2017: NHANES Fourth National Report: Urinary Toxic Metals[4]

METAL	MEAN	50th %	75th %	90th %	95th %
Antimony	.592	.347	.670	1.14	.166
Arsenic	7.27	6.30	11.9	17.6	52.6
Barium	1.26	1.14	2.33	4.06	5.58
Cadmium	.144	.138	.388	.563	.800
Cesium	4.55	4.42	6.37	8.61	10.3
Cobalt	.452	.403	.658	.989	1.31
Lead	.320	.313	.519	.823	1.16
Mercury	.388	.270	.573	1.20	1.63
Platinum	N/A	<LOD	<LOD	.023	.038
Thallium	.352	.314	.398	.598	.429
Tin	.408	.438	.895	2.25	3.72
Tungsten	.068	.065	.124	.224	.332
Uranium	.008	.005	.018	.030	.038

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Case-hypothyroidism

Most urinary aluminum reflects leaching from a prosthetic implant but she had none.

Her kidney function was normal thus eliminating renal failure or dialysis as an explanation for the aluminum elevation.

We deemed her very high aluminum was from her diet, cookware, water and air pollution and possibly buffered aspirin she took daily.

The cadmium and mercury elevations were also most likely from food exposure and she had no recent vaccines or dental amalgams.

She had been living in Phoenix Arizona for 15years at the time of her metal test and not using a water filter at home or work.

The Phoenix area is known for higher than average levels of cesium and uranium in the water.

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Case-hypothyroidism

8week chelation plan with a body weight dose DMSA three days in a row with an 11-day break. She was 150 pounds=68kg
- DMSA 200mg TID 3 days on and 11 days off=one round, did three rounds

Supplement to provide co-factors for liver phase one and two metabolism- six a day LOE B

Liver herbs- 2 a day LOE B
- Included milk thistle, beet root, burdock root, dandelion root and artichoke leaf (200mg of each)

NAC 600mg a day LOE B

Sauna therapy 1-2 times a week for 8-10 weeks
- 7-10 minutes in the heat then 30 second cold shower, repeat 5-6 times and end on cold. LOE C
- PMID:26026145 LOE B and PMID: 26267297 LOE B 23634851 LOE B

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Case-hypothyroidism

At the end of eight weeks she had more energy, could think clearer, and the eye brow and lash returned to dark color.

We retested the metals using unprovoked urine and the levels were now normal via the labs reference ranges and the NHANES percentiles.

The aluminum lowered from 39 to 2.6, cadmium lowered from 07. To 0.3

cesium was 12 and now 4

lead was 0.4 now 0.2

mercury was 1.3 and now 0.5.

Her naturthroid dose was eventually lowered to 1/4 grain from 1 grain and her TSH has been stable and runs between 1-2.

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Resources

National Association of Environmental Medicine, NAEM [https://envmedicine.com]

The Endocrine Disruptor Exchange (TEDx) [https://endocrinedisruption.org]

Environmental Work Group (EWG) [https://www.ewg.org]

AirNow [https://www.airnow.gov]

The Collaborative on Health and the Environment [https://www.healthandenvironment.org/]

National Testing laboratories. Water testing [https://watercheck.com/]

Priority One Vitamins [https://www.priorityonevitamins.com/]

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