DR. HYMAN+

Environmental Toxins: Heavy Metals

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Presentation Overview

- What are Heavy Metals
- Discussion on the most toxic of Metals- Eight Most Detrimental to Health
  - Aluminum, Arsenic, Cadmium,Cesium, Gadolinium, Lead, Mercury, Thallium
- Sources of Metals- Where do they come from
- Negative Impact on our Health and the Environment
- How to test for Heavy Metals
- How to Detox Metals from the Body
- Treatment Strategies- Chelation
- Two Case Studies- Thallium and Mercury
- Clean Living Resources

Heavy Metals: What Are They?

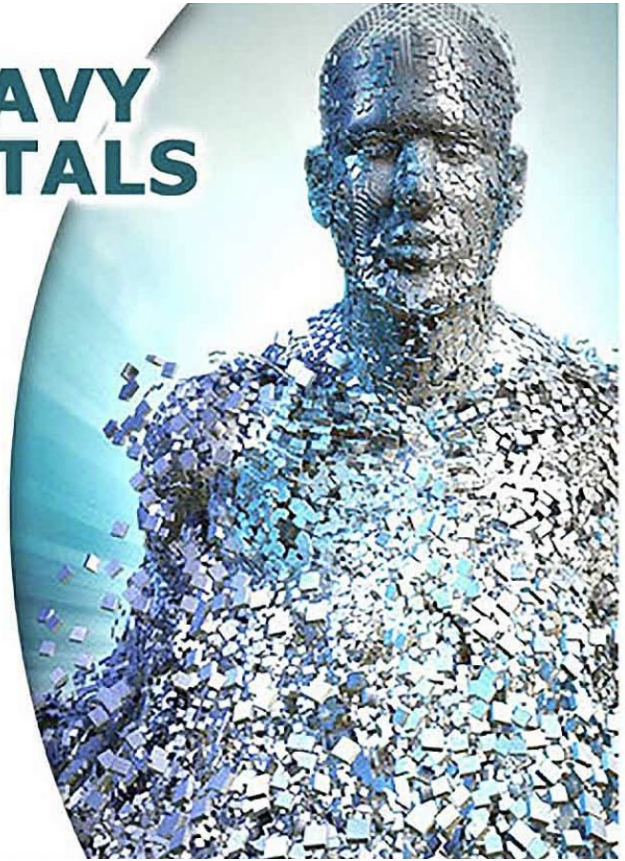
What are Heavy Metals?

- Naturally-occurring elements found in the earth's crust with a density 5 times higher than water
- Humans have been extracting (mining/smelting) and using metals from the earth over centuries to aid in their evolution and development
- Found in industrial, domestic, agricultural, medical and technological applications
- Wide distribution in the environment- high pollution in air, water, soil, food
- They carry a high degree of toxicity and harm to the human body even at low levels
- Difficult to eliminate from the body and the environment
- They deplete the essential metals/minerals (Magnesium/Chromium/Molybdenum/Zinc/Selenium/Iron/Manganese/Copper)

HEAVY METALS

ARSENIC
TUNGSTEN
NICKEL
BERYLLIUM
ANTIMONY
PLATINUM
CADMIUM
CESIUM
ALUMINUM

LEAD
BARIUM
TIN
COPPER
URANIUM
THORIUM
MERCURY
THALLIUM



Toxic Heavy Metals

21 metals are now considered toxic to the human body:

- **Aluminum (Al)**
- Antimony (Sb)
- **Arsenic (As)**
- Barium (Ba)
- Beryllium (Be)
- Bismuth (Bi)
- **Cadmium (Cd)**
- **Cesium (Cs)**
- **Gadolinium (Gd)**
- **Lead (Pb)**
- **Mercury (Hg)**
- Nickel (Ni)
- Palladium (Pd)
- Platinum (Pt)
- Tellurium (Te)
- **Thallium (Tl)**
- Thorium (Th)
- Tin (Sn)
- Titanium (Ti)
- Tungsten (W)
- Uranium (U)

Why Do Heavy Metals Matter?

- We are all exposed to Heavy Metals in our daily living environments
- Most of us **are exposed to metals in utero**
- They have an **incredibly negative impact on our health** acutely and long term
- They disrupt the function of most systems in our body leading to many diseases including **Dementia, Parkinson's, Alzheimer's, Autoimmune Disease**, Mood Disorders, Learning Disorders, Neurological Problems, **Endocrine Dysfunction, Fertility Problems, ADD/ADHD, Autism and Cancer**
- They also disrupt the Immune System, making it **more challenging to heal from infections** (Lyme, Viruses, Parasites, Mold)

Heavy Metals: Sources

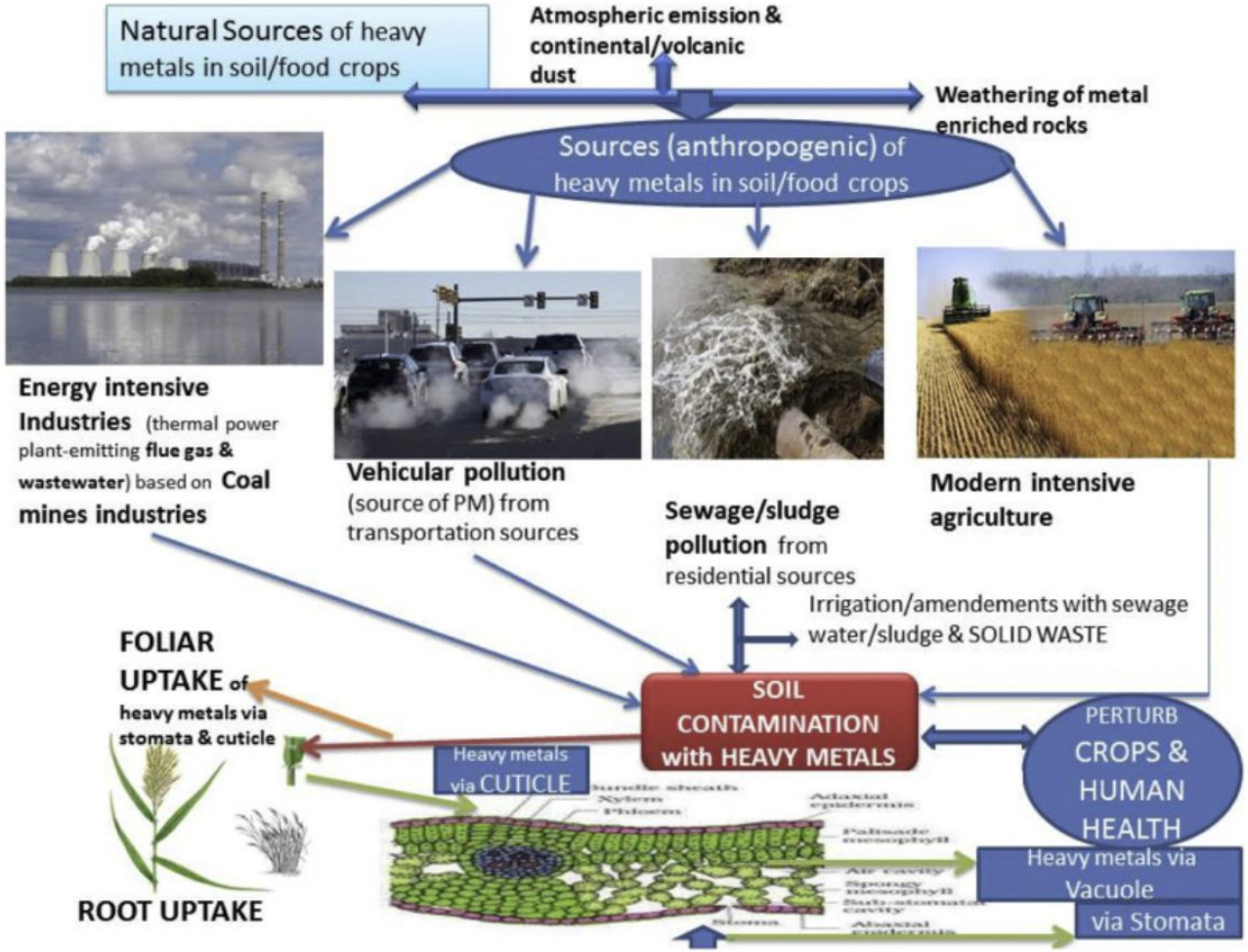
Endogenous vs. Exogenous Sources

Endogenous

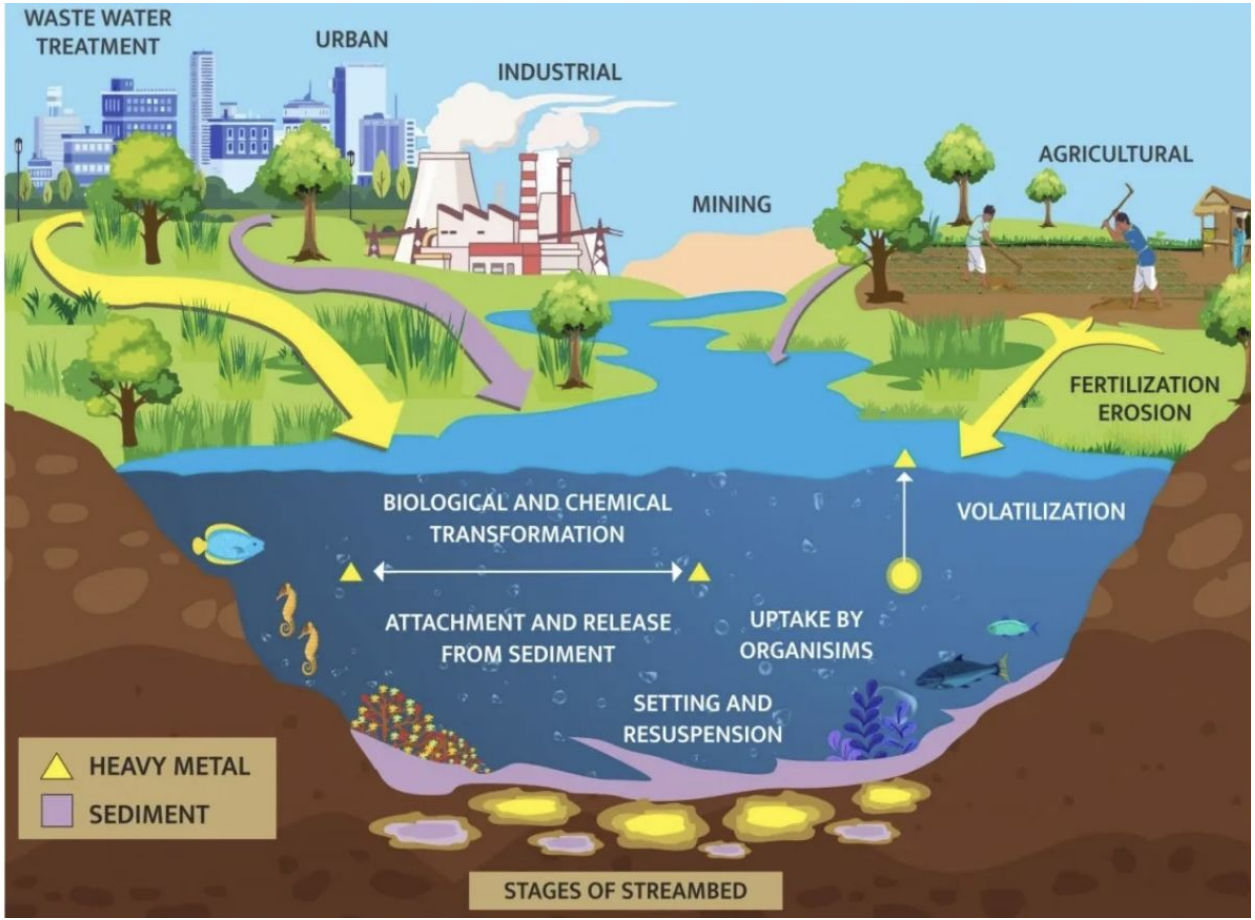
- Implants
- Amalgams
- Prosthetics

Exogenous

- Food
- Air
- Water
- Pharmaceuticals
- Beauty Products
- Household Items
- Imaging studies with Contrast/ Barium Swallow



Air/Soil Contamination



Water Contamination

7 Household Items CONTAMINATED with TOXIC HEAVY METALS

Toxic heavy metals can be found in many common household items. Here's what to watch out for so you can protect your health.

1. Carpet & Area Rugs
Carpet can harbor lead dust inside the fibers, along with other toxic chemicals that can be released into the air in your home.

2. Aluminum Pots & Pans
As aluminum pots and pans age or wear down, you risk being exposed to aluminum every time you consume a home-cooked meal.

3. Tap Water
Thanks to old lead pipes, many water sources test positive for the toxic heavy metal. Run taps before using the water and drink filtered water.

4. Beauty & Self-Care Products
Cosmetics and deodorant can all have heavy metals. Red lipstick often contains lead, while decorative jewelry may have high levels of cadmium.

5. Ceramic Mugs, Plates & Bowls
Shiny glaze added to ceramic dishes may contain lead and cadmium. Drinking your coffee from a stainless-steel container is a safer option.

6. Furniture & Mattresses
As furniture ages, the dyes and chemical finishes in them break down, exposing you to heavy metals and other toxic volatile organic compounds (VOCs).

7. Old Paint Residues
According to the CDC, all homes built before 1978 are likely to have some lead paint. This breaks down into toxic lead dust which you unknowingly breathe in.

Household Contamination

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POISON IVY'S KISS

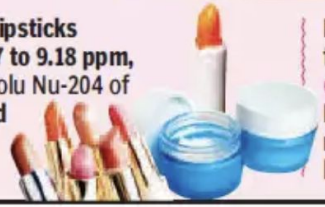
Of 32 fairness creams tested for mercury, 14 had it in the range of 0.10 ppm* to 1.97 ppm. This heavy metal is banned for use in cosmetics under the Drugs and Cosmetics Acts and Rules

30 **lipsticks,** 8 **lipbalms &** 3 **anti-ageing** creams were also tested for lead, cadmium, chromium & nickel

Aroma Magic Fair lotion — a product of **Blossom Kochhar Beauty Products Pvt Ltd** — had the highest level of mercury (1.97 ppm), followed by Procter and Gamble's **Olay Natural White (1.79 ppm),** and Ponds White Beauty of Hindustan Unilever (1.36 ppm)

Chromium found in 15 **lipsticks tested in range of 0.45 ppm to 17.83 ppm;** Hearts and Tarts (080V) shade of **ColorBar had the highest concentration of chromium**

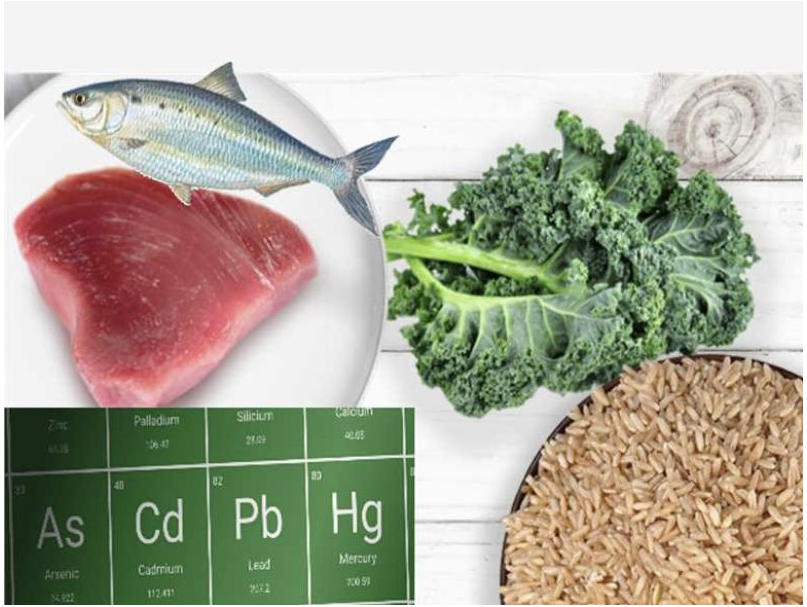
Nickel found in 13 **lipsticks tested in range 0.57 to 9.18 ppm,** with LancomeLabsolu Nu-204 of **L'Oreal India Pvt Ltd** having the highest concentration



No heavy metals found in anti-ageing creams and lipbalms. Lead and cadmium not detected in lipsticks

* parts per million

Beauty Products Contamination



Food Contamination

Baby Foods Are Tainted with Dangerous Levels of Arsenic, Lead, Cadmium, and Mercury

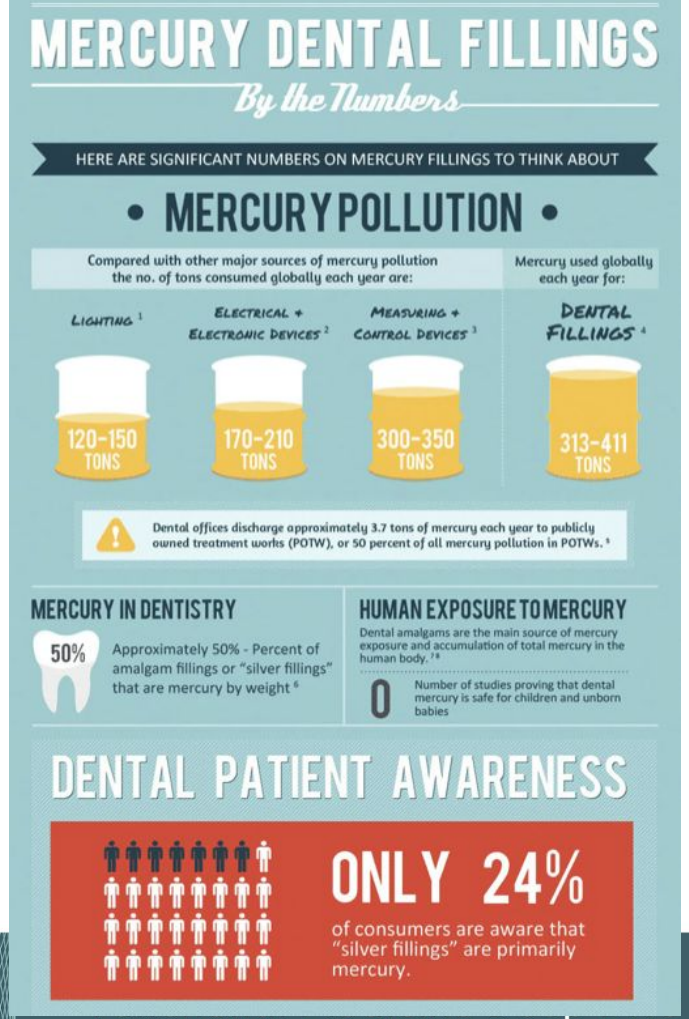
Staff Report

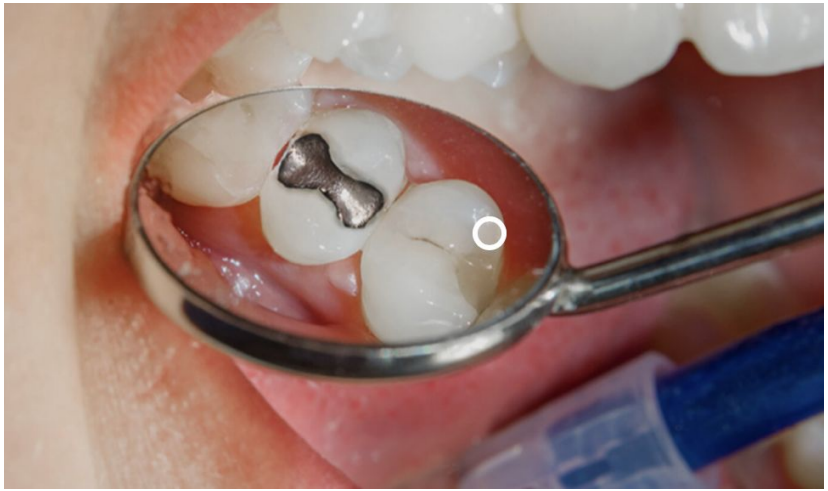
Subcommittee on Economic and Consumer Policy
Committee on Oversight and Reform
U.S. House of Representatives

February 4, 2021

oversight.house.gov

Food Contamination





Amalgams- Dentistry Contamination

Aluminum in Childhood Vaccines Is Unsafe

Neil Z. Miller

ABSTRACT

Aluminum is a neurotoxin, yet infants and young children are repeatedly injected with aluminum adjuvants from multiple vaccines during critical periods of brain development. Numerous studies provide credible evidence that aluminum adversely affects important biological functions and may contribute to neurodegenerative and autoimmune disorders. It is impossible to predetermine which vaccinated babies will succumb to aluminum poisoning. Aluminum-free health options are needed.

Introduction

From 1999 through 2002, several vaccines containing mercury were phased out of the childhood immunization schedule. Manufacturing of childhood vaccines with thimerosal ceased in 2001, but those that were not past their expiration date remained on the market for sale until January 2003.[1] They were replaced with low-mercury or "thimerosal-free" vaccines. In the years that followed, autism rates continued to rise, prompting health authorities to assert that autism is not linked to mercury in vaccines and that vaccination policies are safe and appropriate.[2-4] (If mercury in vaccines contributed to autism, then rates should have dropped after mercury was removed.) However, in 2002, during this so-called phase-out period, the Centers for Disease Control and Prevention (CDC) actually added two doses of mercury-containing influenza vaccines to the list of inoculations urged for all babies 6 to 23 months of age.[5] Two years later, the CDC also added *pregnant women in their first trimester* to the list of people officially recommended and actively encouraged to receive influenza vaccines, even though a majority of available doses contained mercury.[6]

In addition to these questionable actions during this highly publicized "phase-out" of mercury, four doses of a new vaccine with high *aluminum* content were added to the childhood immunization schedule in February 2000 (for pneumococcus) and two doses of another aluminum-containing vaccine (for babies in utero, infants, and young children were injected with, and continue to receive, unnaturally high doses of neurotoxic substances—mercury and aluminum—long after unsuspecting parents were led to believe that vaccines were purified and made safe.

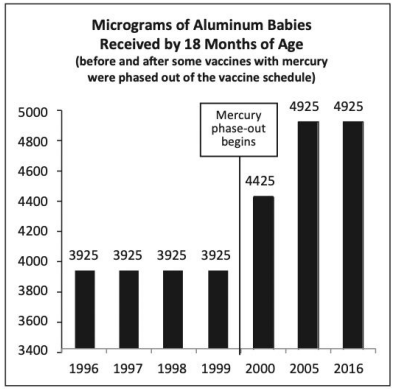


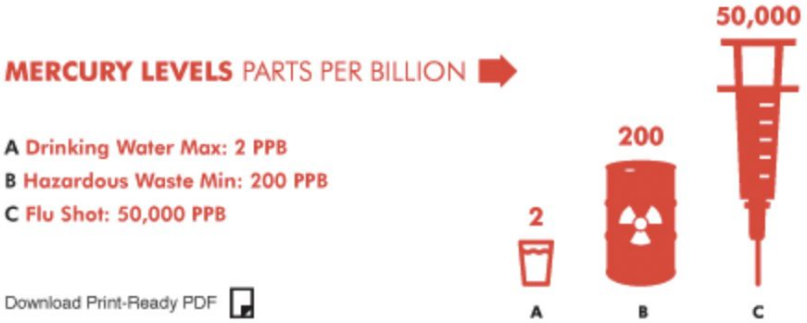
Figure 1. Aluminum Content from Childhood Vaccines

Vaccines containing aluminum were added to the childhood immunization schedule when some vaccines containing mercury were removed. Prior to the mercury phase-out (pre-2000), babies received 3,925 mcg of aluminum by 18 months of age. After pneumococcal and hepatitis A vaccines were added to the schedule, babies began receiving 4,925 mcg of aluminum during the same age period—a 25% increase.

Source: The vaccine manufacturers' product inserts and the CDC's annual childhood vaccination schedules.

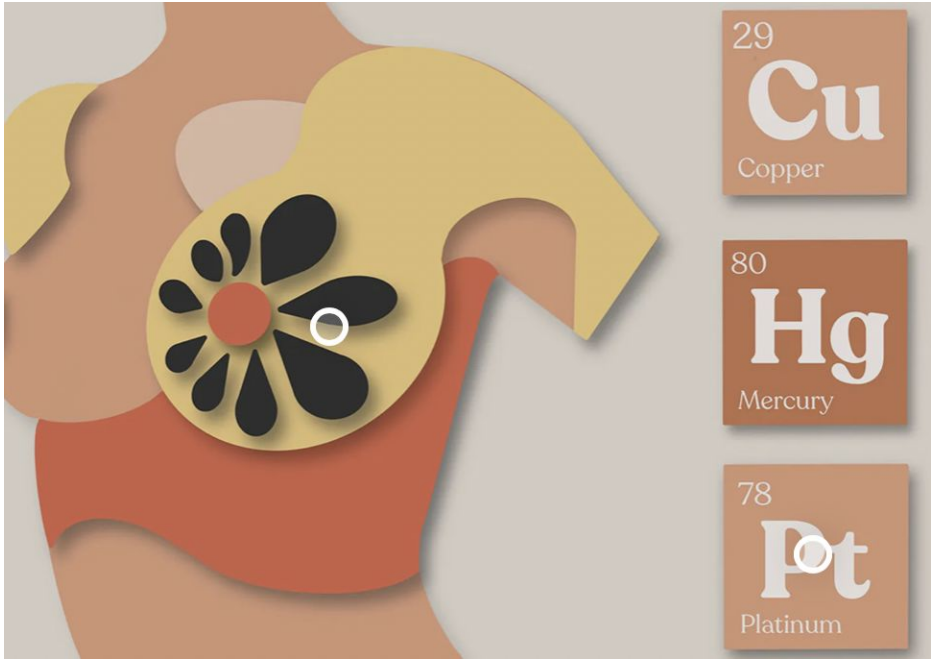
Pharmaceutical Contamination

A TYPICAL 0.5 MILLILITER FLU SHOT CONTAINS TWENTYFIVE MICROGRAMS OF MERCURY – or 50,000 parts per billion. The EPA classifies a liquid with 200 parts per billion of mercury as hazardous waste. The limit for drinking water is two parts per billion.



Source: Environmental Health Perspectives

BIOSCIENCES BIOTECHNOLOGY RESEARCH ASIA, August 2014. Vol. **11**(2), 941-946



Breast Implants Contamination

Determination of Heavy Metals in Tattoo Ink

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In recent years, tattoos have become very popular worldwide and millions of people have black or colored tattoos. Despite the increasing number of tattooed individuals, presently there are few requirements, legislation and criteria for the safety of tattoos and permanent make-up. The aim of the survey is to assess whether the common or commercially purchased tattoo permanent inks in Iran market comply with maximum concentrations of heavy metals in the EPA's guidelines and find out the relation of colours by Zinc, Lead and Cadmium contents. 100 samples of 12 different permanent make –up ink tattoo brands in different available colours were randomly purchased from cosmetic stores and market in Tehran in main seven colours.: black, White ,yellow, brown ,red ,green and brown. Lead, Cadmium and Zinc contents were analysed by a Flame Emission Spectrophotometer. Analysis of variance (ANOVA) was done on each brand of tattoo ink to find out if there is significant variation in the concentrations of heavy metals in different colours of each brand. This result reveals that the type of pigment used in tattoo inks contributes to its heavy metal content. All the tattoo ink samples monitored in this study contained detectable contents of lead and cadmium. Cadmium contents in all group colours in Chinese and USA brands (probably fake brands) samples was much higher than maximum limited 0.2 mg/kg set by EPA and the highest one related to white colour 2.1473 mg/kg. In black and white colour the highest and lowest level of lead were observed respectively. White , yellow and orange ink samples showed the highest level of zinc content, while all samples had less content of this metal comparing by Maximum concentrations of zinc 50 mg/kg in tattoo and permanent make-up substances given in the EPA's *Guidelines* in 2012.

Key words: Tattoo ink, Heavy metals, Cadmium, Pigment, Colour.

Heavy Metals: The Most Common

Heavy Metal: Aluminium

Heavy Metal: Aluminium

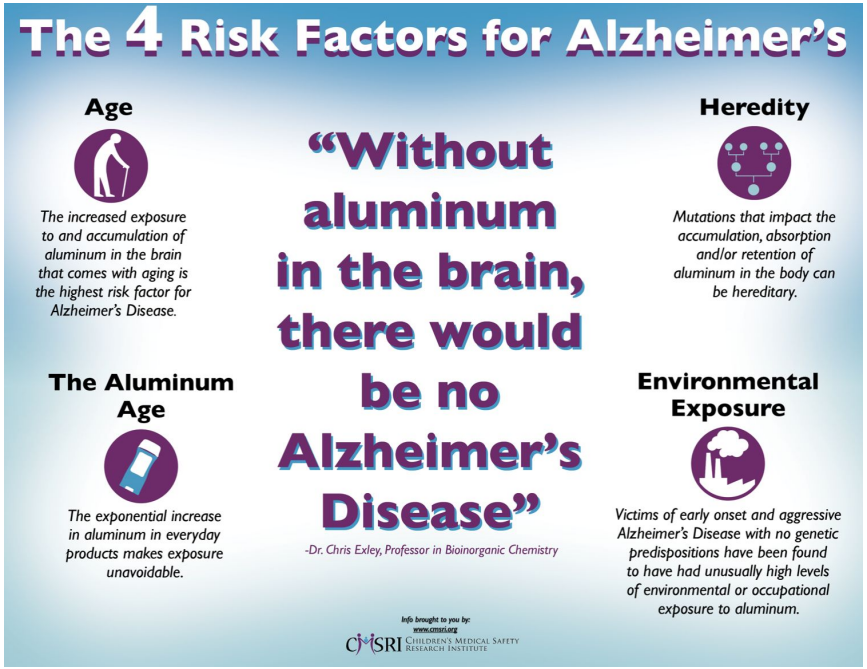
Heavy Metal: Aluminium

- **Antiperspirants**
- Antacids
- Buffered aspirin
- **Adjuvants in vaccines**
- Flour
- Frozen dinners
- Aluminum cans

- Coloring agents
- Food cooked in **aluminum cookware**
- Infant formulas
- Dialysis fluid
- Anticaking agents
- Cigarette Smoking

Aluminum retention is greatest AND most problematic in those with kidney disease

Aluminium: Health Impact



Aluminium in brain tissue in familial Alzheimer's disease

Ambreen Mirza [1], Andrew King [2], Claire Troakes [3], Christopher Exley [4]

Affiliations + expand

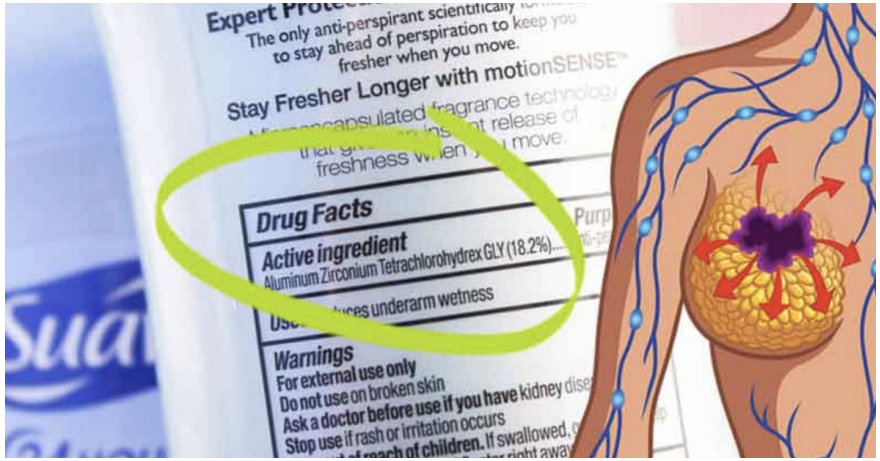
PMID: 28159219 DOI: 10.1016/j.jtemb.2016.12.001

Free article

Abstract

The genetic predispositions which describe a diagnosis of familial Alzheimer's disease can be considered as cornerstones of the amyloid cascade hypothesis. Essentially they place the expression and metabolism of the amyloid precursor protein as the main tenet of disease aetiology However, we do not know the cause of Alzheimer's disease and environmental factors may yet be shown to contribute towards its onset and progression. One such environmental factor is human exposure to aluminium and aluminium has been shown to be present in brain tissue in sporadic Alzheimer's disease. We have made the first ever measurements of aluminium in brain tissue from 12 donors diagnosed with familial Alzheimer's disease. The concentrations of aluminium were extremely high, for example, there were values in excess of 10μg/g tissue dry wt. in 5 of the 12 individuals. Overall, the concentrations were higher than all previous measurements of brain aluminium except cases of known aluminium-induced encephalopathy. We have supported our

Aluminium: Health Impact



Aluminium, antiperspirants and breast cancer

P D Darbre [1]

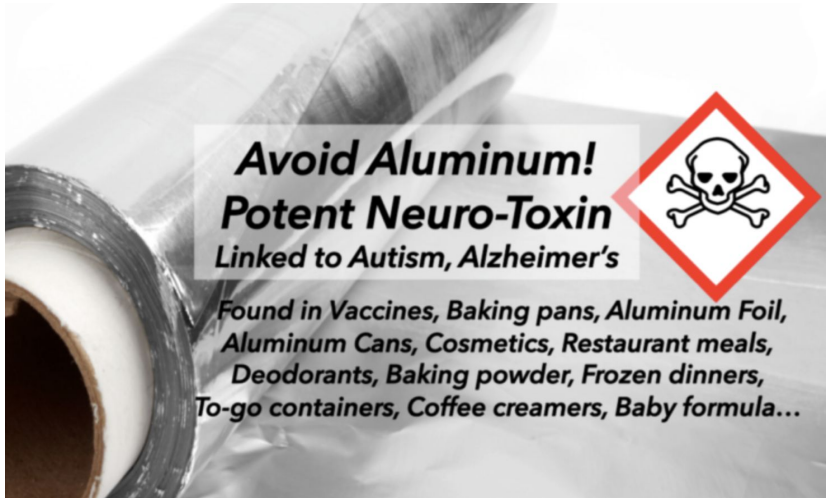
Affiliations + expand

PMID: 16045991 DOI: 10.1016/j.jinorgbio.2005.06.001

Abstract

Aluminium salts are used as the active antiperspirant agent in underarm cosmetics, but the effects of widespread, long term and increasing use remain unknown, especially in relation to the breast, which is a local area of application. Clinical studies showing a disproportionately high incidence of breast cancer in the upper outer quadrant of the breast together with reports of genomic instability in outer quadrants of the breast provide supporting evidence for a role for locally applied cosmetic chemicals in the development of breast cancer. Aluminium is known to have a genotoxic profile, capable of causing both DNA alterations and epigenetic effects, and this would be consistent with a potential role in breast cancer if such effects occurred in breast cells. Oestrogen is a well established influence in breast cancer and its action, dependent on intracellular receptors which function as ligand-activated zinc finger transcription factors, suggests one possible point of interference from aluminium. Results reported here demonstrate that aluminium in the form of aluminium chloride or aluminium chlorhydrate can interfere with the function of oestrogen receptors of MCF7 human breast cancer cells both in terms of ligand binding and in terms of oestrogen-regulated reporter gene expression. This adds aluminium to the increasing list of metals capable of interfering with oestrogen action and termed metalloestrogens. Further studies are now needed to identify the molecular basis of this action, the longer term effects of aluminium exposure and whether aluminium can cause aberrations to other signalling pathways in breast cells. Given

Aluminium: Health Impact



Aluminium in brain tissue in autism

Matthew Mold [1], Dorcas Umar [2], Andrew King [3], Christopher Exley [1]

Affiliations + expand

PMID: 29413113 DOI: 10.1016/j.jtemb.2017.11.012

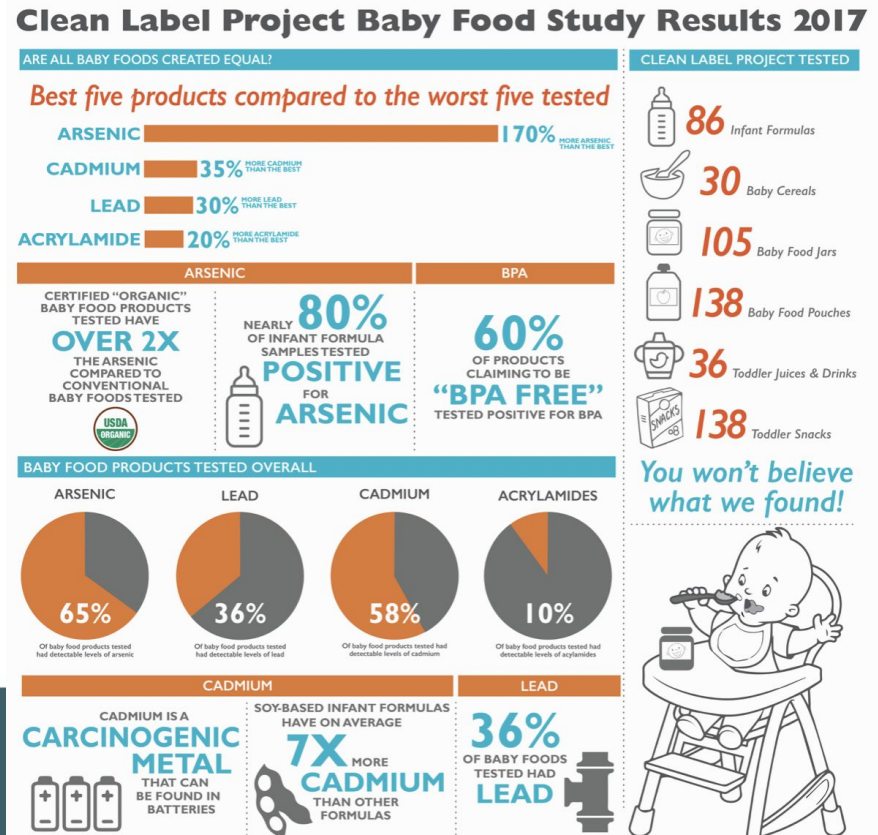
Free article

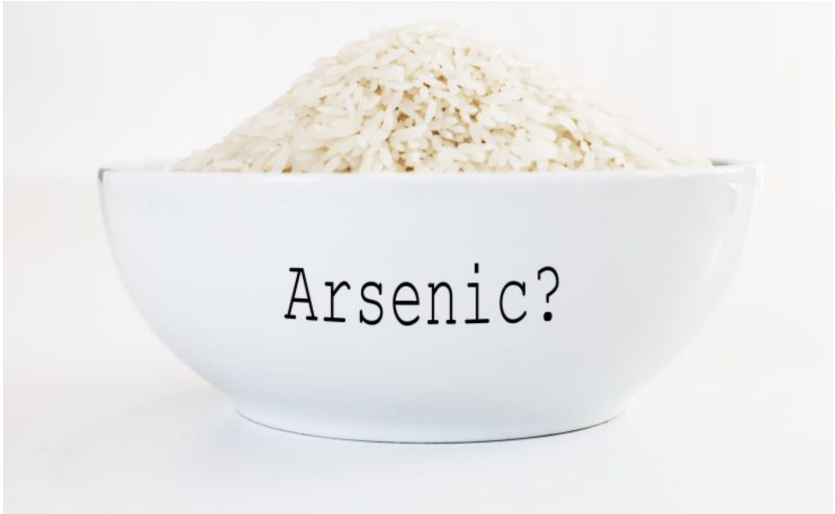
Abstract

Autism spectrum disorder is a neurodevelopmental disorder of unknown aetiology. It is suggested to involve both genetic susceptibility and environmental factors including in the latter environmental toxins. Human exposure to the environmental toxin aluminium has been linked, if tentatively, to autism spectrum disorder. Herein we have used transversely heated graphite furnace atomic absorption spectrometry to measure, for the first time, the aluminium content of brain tissue from donors with a diagnosis of autism. We have also used an aluminium-selective fluor to identify aluminium in brain tissue using fluorescence microscopy. The aluminium content of brain tissue in autism was consistently high. The mean (standard deviation) aluminium content across all 5 individuals for each lobe were 3.82(5.42), 2.30(2.00), 2.79(4.05) and 3.82(5.17) μg/g dry wt. for the occipital, frontal, temporal and parietal lobes respectively. These are some of the highest values for aluminium in human brain tissue yet recorded and one has to question why, for example, the aluminium content of the occipital lobe of a 15year old boy would be 8.74 (11.59) μg/g dry wt.? Aluminium-selective fluorescence microscopy was used to identify aluminium in brain tissue in 10 donors. While aluminium was imaged associated with neurones it appeared to be present intracellularly in microglia-like cells and other inflammatory non-neuronal cells in the meninges, vasculature, grey and white matter. The pre-eminence of intracellular aluminium associated with non-neuronal cells was a standout observation in autism brain tissue and may offer clues as to both the origin of the brain aluminium as well as a putative role in autism spectrum disorder.

Heavy Metal: Arsenic

Heavy Metal: Arsenic





Heavy Metal: Arsenic

- **Tap water/ Private Well Water**
- **Rice (Brown Rice** is higher than White Rice)- **Organic 2X higher**
- Shellfish
- Seaweed
- Apple/Grape Juice
- **Cigarette smoke**
- **Infant Formula**
- **Protein Powders**
- Chicken
- Pesticides
    - Cacodylic acid/Monosodium methyl arsenate

Arsenic Water Contamination

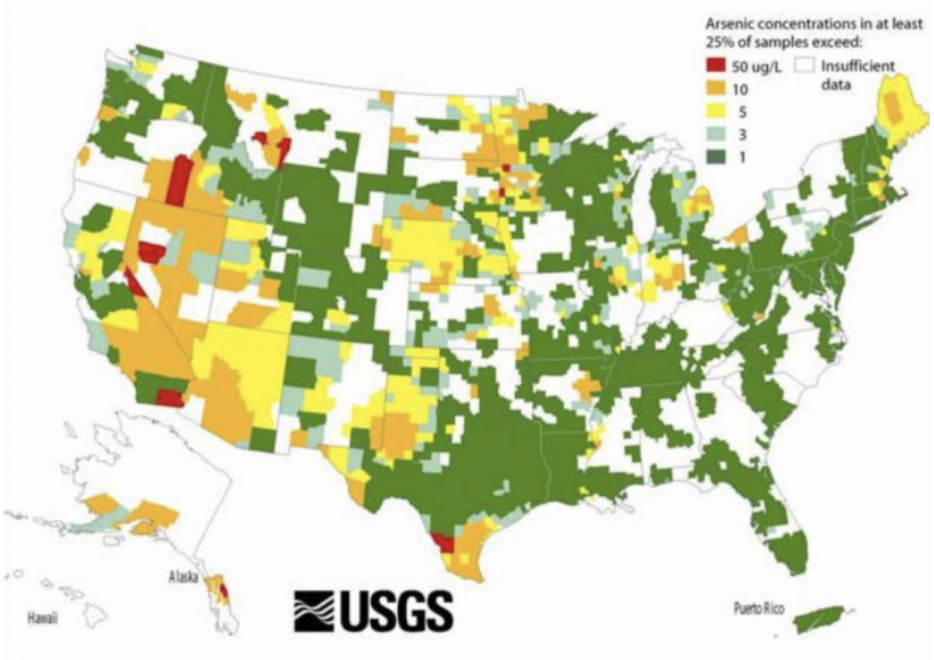


Figure 1: US Geological Survey Map of Arsenic in Groundwater (USGS, 2005).

Arsenic Contamination of Groundwater: A Review of Sources, Prevalence, Health Risks, and Strategies for Mitigation

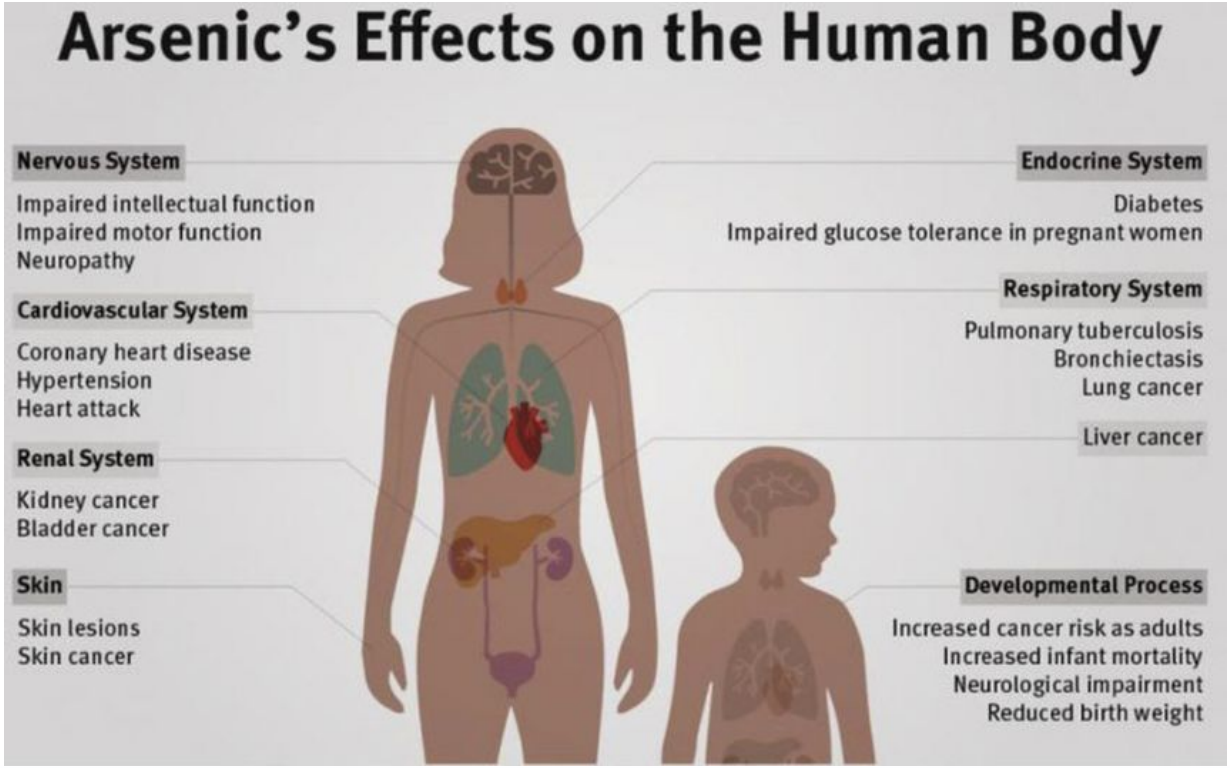
Shiv Shankar, [1] Uma Shanker, [2,*] and Shikha [1]

Abstract

Go to:

Arsenic contamination of groundwater in different parts of the world is an outcome of natural and/or anthropogenic sources, leading to adverse effects on human health and ecosystem. Millions of people from different countries are heavily dependent on groundwater containing elevated level of As for drinking purposes. As contamination of groundwater, poses a serious risk to human health. Excessive and prolonged exposure of inorganic As with drinking water is causing arsenicosis, a deteriorating and disabling disease characterized by skin lesions and pigmentation of the skin, patches on palm of the hands and soles of the feet. Arsenic poisoning culminates into potentially fatal diseases like skin and internal cancers. This paper reviews sources, speciation, and mobility of As and global overview of groundwater As contamination. The paper also critically reviews the As led human health risks, its uptake, metabolism, and toxicity mechanisms. The paper provides an overview of the state-of-the-art knowledge on the alternative As free drinking water and various technologies (oxidation, coagulation flocculation, adsorption, and microbial) for mitigation of the problem of As contamination of groundwater.

Arsenic: Health Impact



Arsenic: Health Impact

Arsenic Exposure and the Induction of Human Cancers

Victor D. Martinez, [1, 2, *] Emily A. Vucic, [1] Daiana D. Becker-Santos, [1] Lionel Gil, [2] and Wan L. Lam [1]

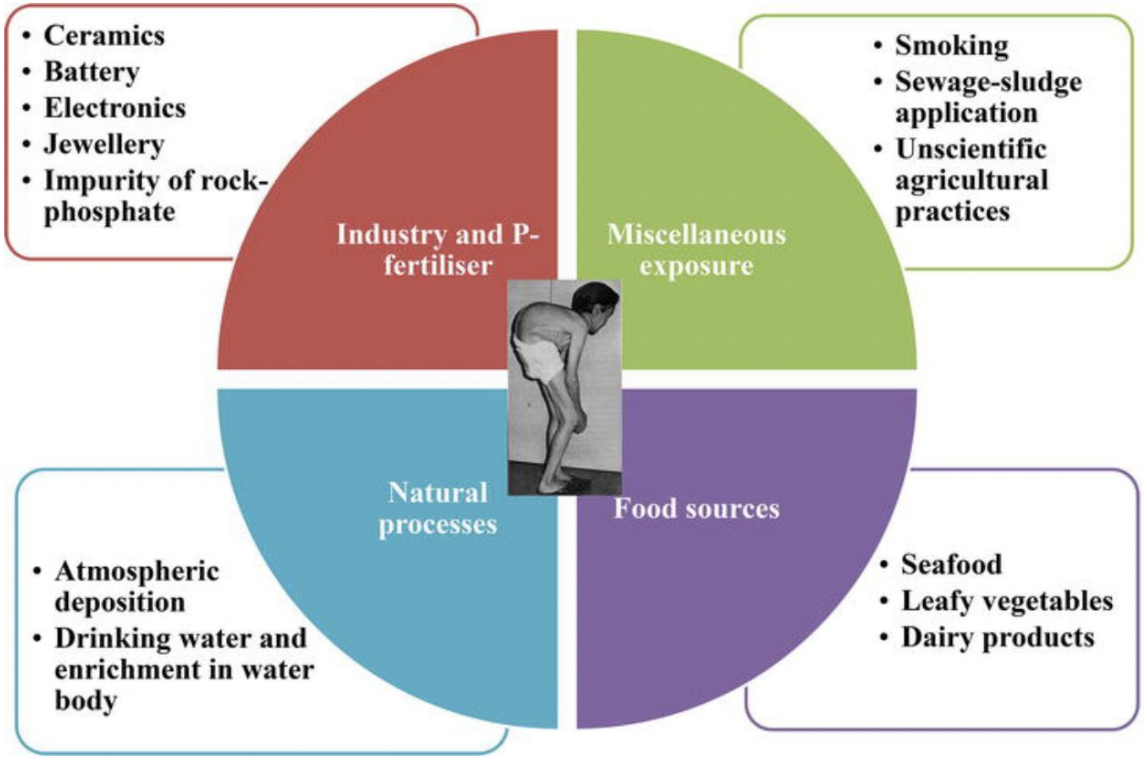
Abstract

Go to:

Arsenic is a metalloid, that is, considered to be a human carcinogen. Millions of individuals worldwide are chronically exposed through drinking water, with consequences ranging from acute toxicities to development of malignancies, such as skin and lung cancer. Despite well-known arsenic-related health effects, the molecular mechanisms involved are not fully understood; however, the arsenic biotransformation process, which includes methylation changes, is thought to play a key role. This paper explores the relationship of arsenic exposure with cancer development and summarizes current knowledge of the potential mechanisms that may contribute to the neoplastic processes observed in arsenic exposed human populations.

Heavy Metal: Cadmium

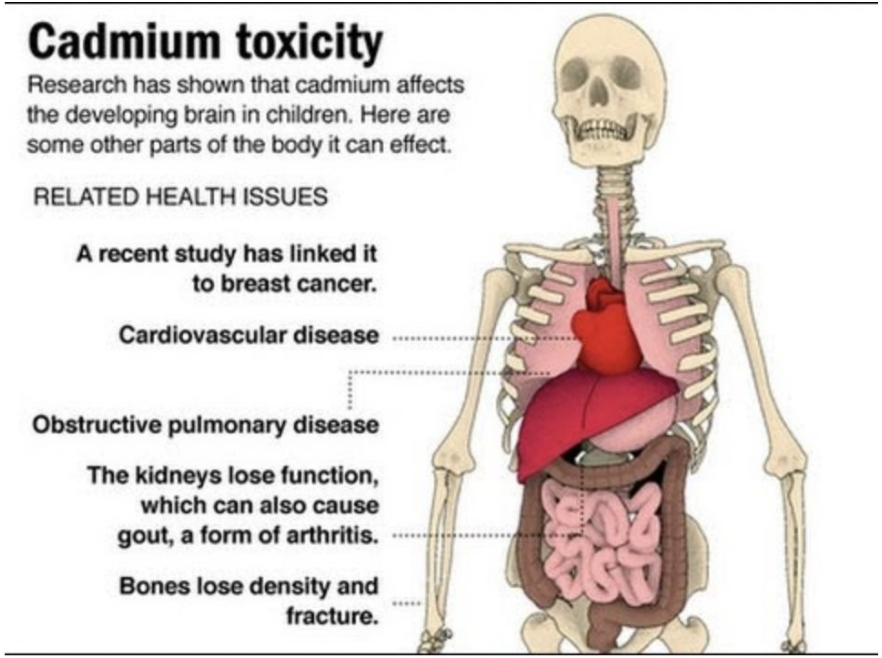
Heavy Metal: Cadmium



Heavy Metal: Cadmium

- **Batteries**
- Paints
- Plastics
- Fossil Fuel Combustion- Coal Ash
- **Cigarette smoke**
- Shellfish
- **Sunflower seeds**
- **Tofu**
- Refined Flours
- Coffee/Tea

Cadmium: Health Impact



Human health effects of exposure to cadmium

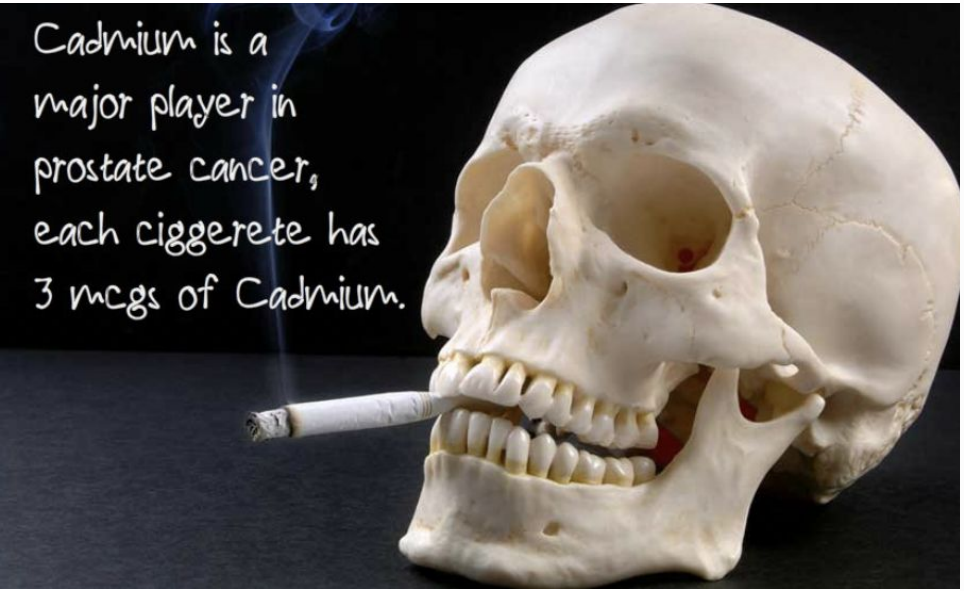
William H. Hallenbeck

Experientia **40**, 136–142 (1984) | Cite this article

Summary

The health effects of human exposure to cadmium are discussed with emphases on intake, absorption, body burden, and excretion; osteomalacia in Japan; hypertension; and proteinuria, emphysema, osteomalacia, and cancer in workers. Elevated blood pressure has not been observed as a result of excessive exposures to cadmium in Japan or the workplace. Renal tubular dysfunction and consequent proteinuria is generally accepted as the main effect following long-term, low-level exposure to cadmium. Studies of workers show that proteinuria may develop after the first year of exposure or many years after the last exposure. Proteinuria and deterioration of renal function may continue even after cessation of exposure. The immediate health significance of low-level proteinuria is still under debate. However, there is evidence that long-term renal tubular dysfunction may lead to abnormalities of calcium metabolism and osteomalacia. The few autopsy and crosssectional studies of workers do not permit conclusions to be drawn regarding the relationship between cadmium exposure and emphysema. Retrospective and historical-prospective studies are

Cadmium: Health Impact



Cadmium and cancer of prostate and testis

Robert A. Goyer, Jie Liu & Michael P. Waalkes

Biometals **17**, 555–558 (2004) | Cite this article

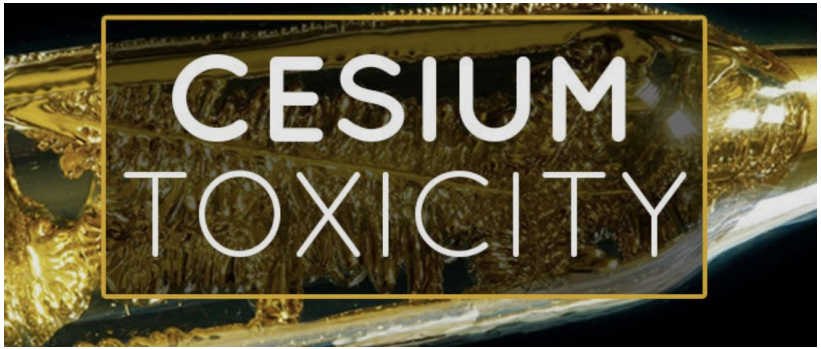
550 Accesses | **166** Citations | Metrics

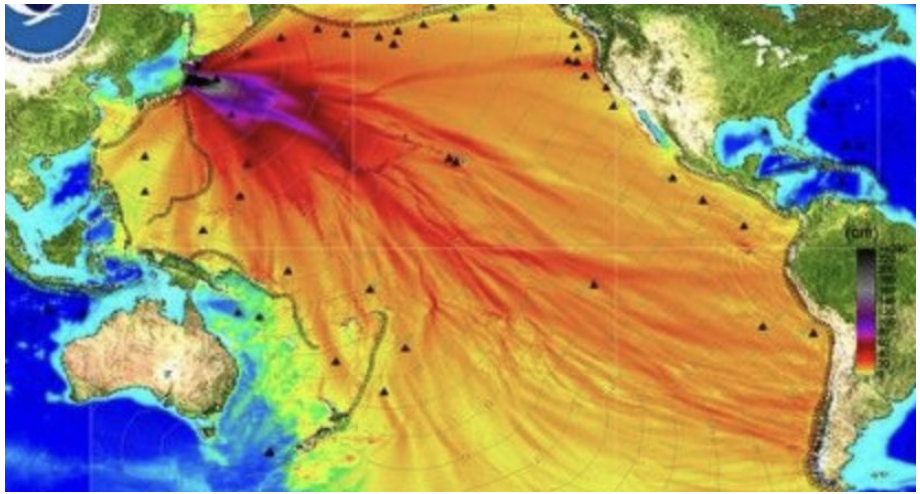
Abstract

Cancer of the prostate is an important and potentially fatal disease in humans but the etiology is yet undefined. Cadmium and cadmium compounds are known to be human carcinogens based on findings of increased risk to lung cancer among exposed workers, but a relationship between cancer of the prostate and/or testis in humans is unclear in spite of suggestive results in rats. Parenteral administration or oral exposure to cadmium can result in proliferate lesions and tumors of the prostate in rats. The ability of cadmium to produce neoplasms in the prostate of rats is atypically dose-related and only occurs in rats at doses below the threshold for significant testicular toxicity. Testicular androgen production is essential for the maintenance of the prostate and prostate tumors. The rat testis may also develop tumors if cadmium is given parenterally at high doses. Subsequent to testicular hemorrhagic necrosis, there will be loss of testosterone production and hyperplasia and neoplasia of testicular interstitial cells, thought to be a response to trophic hormone release from the pituitary. The pathogenesis of prostatic cadmium carcinogenesis might include aberrant gene expression resulting in stimulation of cell proliferation or blockage of

Heavy Metal: Cesium

Heavy Metal: Cesium

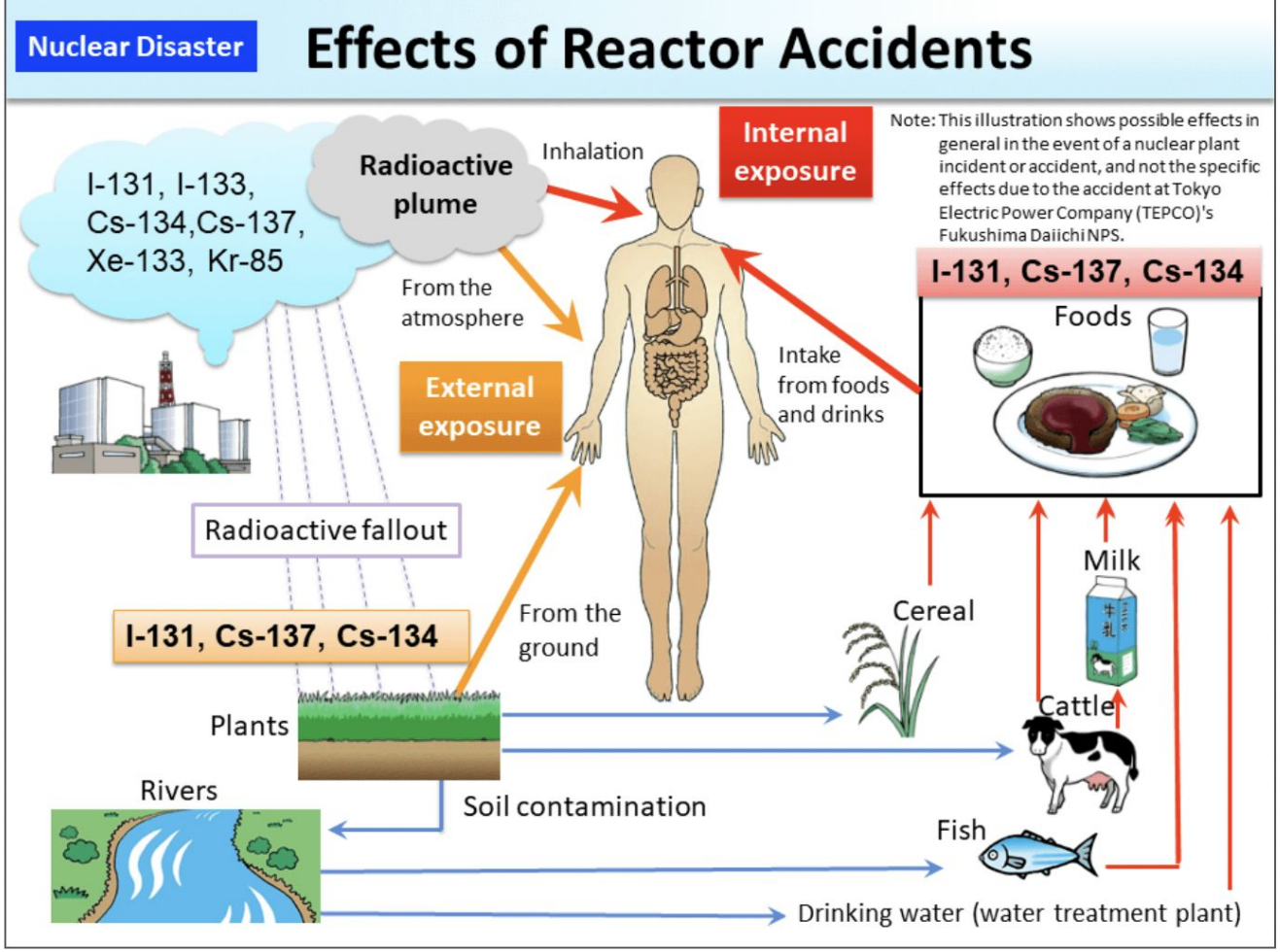




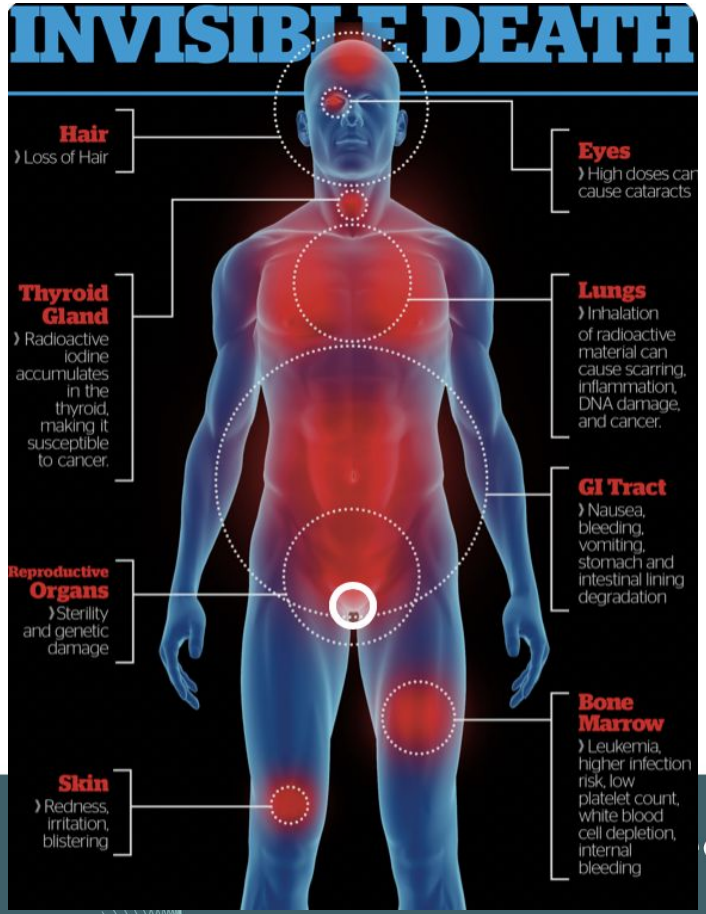
Fukushima Nuclear Accident- Pacific Ocean Contamination

Heavy Metal: Cesium

- Contaminated soil from power plant waste dump
- Water contamination from **radioactive waste material**
- Global cesium levels have increased significantly since **Chernobyl accident** in 1986 and even higher since **Fukushima accident** in 2011
- **Radiation therapy for certain cancers**
- **Eating fish from the Pacific**
- Explosion of nuclear weapons
- Contaminated Rice
- Contaminated Tea
- **Fracking Irrigation Water**


Nuclear Disaster
Effects of Reactor Accidents
I-131, I-133,
Cs-134,Cs-137,
Xe-133, Kr-85
Radioactive plume
Inhalation
Internal exposure
From the atmosphere
External exposure
Note: This illustration shows possible effects in general in the event of a nuclear plant incident or accident, and not the specific effects due to the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS.
I-131, Cs-137, Cs-134
Foods
Intake from foods and drinks
Radioactive fallout
I-131, Cs-137, Cs-134
From the ground
Milk
Cereal
Plants
Cattle
Rivers
Soil contamination
Fish
Drinking water (water treatment plant)

Cesium: Health Impact



Acquired long QT syndrome and monomorphic ventricular tachycardia after alternative treatment with cesium chloride for brain cancer

Anuj K Dalal [1], John D Harding, Ralph J Verdino

Affiliations + expand

PMID: 15301336 DOI: 10.4065/79.8.1065

Erratum in

Mayo Clin Proc. 2004 Sep;79(9):1215

Abstract

Individuals searching for symptomatic relief or a potential cure are increasingly seeking and using nontraditional therapies for their various diseases. Little is known about the potential adverse effects that patients may encounter while undergoing these alternative treatments. Cesium chloride is an unregulated agent that has been reported to have antineoplastic properties. Cesium chloride is advertised as an alternative agent for many different types of cancers and can be purchased easily on the Internet. Recently, QT prolongation and polymorphic ventricular tachycardia were

Heavy Metal: Gadolinium

Heavy Metal: Gadolinium

WHERE DOES GADOLINIUM COME FROM?

- Gadolinium occurs naturally and in the earth's surface.
- It is a metal, a basic chemical element.
- Gadolinium does not occur naturally in the human body.
- The only way it gets into the body is injection of a contrast solution containing it.
- Manufacturers of contrast solutions cannot blame people for contributing to causing NSF.

Gadolinium is detectable within the tissue of patients with nephrogenic systemic fibrosis.

High WA, Cowper SE et al. J Am Acad Dermatol 2007;56:21-6

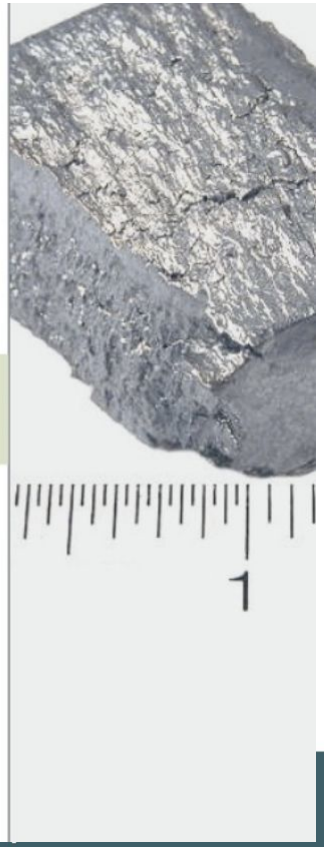
Science of Gadolinium Contrast Solutions

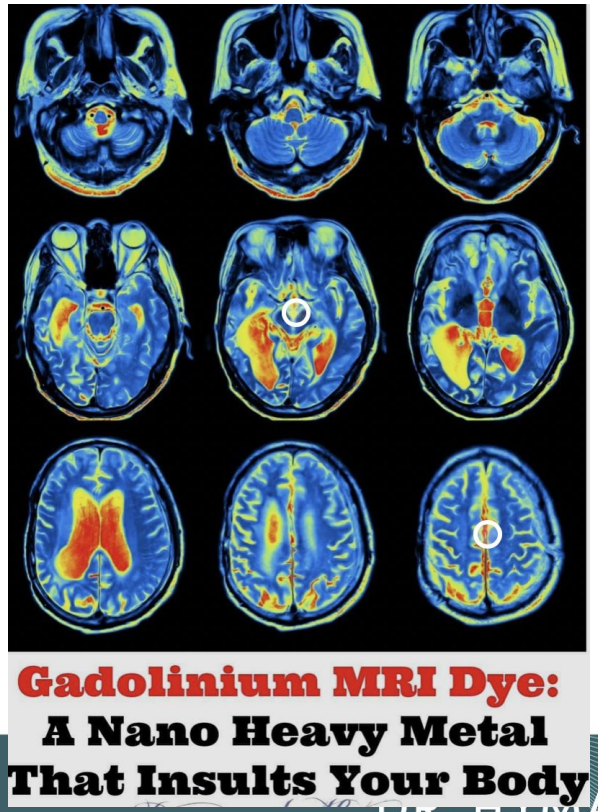
The Number of enhanced MRI's per year.

- 25-30% of MRI's are enhanced with contrast solution.
- About 23 million enhanced MRI's worldwide in 2005.
- About 10 million enhanced MRI's in U.S. in 2005.

GADOLINIUM IN THE BODY

- Gadolinium is not absorbed, breathed, eaten, or drunk.
- There is no background rate.
- Free gadolinium (Gd^{3+}) is a highly poisonous heavy metal, and this has been known for many years.





Heavy Metal: Gadolinium

- Main source is from **MRI/ MRA scans with contrast**
- Gadolinium-based contrast agents (GBCAs) are injected during imaging
- Gadolinium is **stored cumulatively in the brain after repeated MRI scans**
- In 2007 Gadolinium is found to cause Nephrogenic Systemic Fibrosis
- In 2017 European Medicines Agency removes it from the market
- In 2017 the FDA warns (GBCAs) lead to gadolinium retention
- Cumulative exposure can lead to **Gadolinium Deposition Disease**
- Symptoms of Gadolinium poisoning include:
    - Deep bone pain, muscle twitching and weakness, itchy skin, vision problems, ringing in the ears, balance problems, swelling of extremities, hair loss, cognitive symptoms, persistent headaches, brain fog, burning pains in arms legs and torso

Gadolinium: Health Impact

Gadolinium deposition and the potential for toxicological sequelae – A literature review of issues surrounding gadolinium-based contrast agents

Kerry A Layne [1], Paul I Dargan [1], John R H Archer [1], David M Wood [1]

Affiliations + expand

PMID: 30032482 PMCID: PMC6177715 DOI: 10.1111/bcp.13718

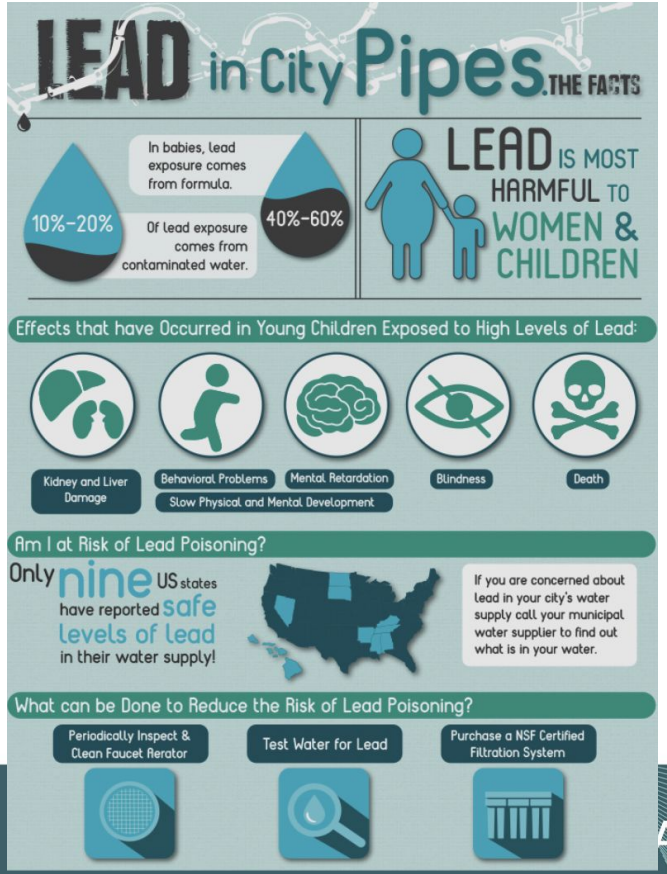
Free PMC article

Abstract

Every year, approximately 30 million magnetic resonance imaging scans are enhanced with gadolinium-based contrast agents (GBCAs) worldwide. Although the development of nephrogenic systemic fibrosis in patients with renal impairment is well-documented, over recent years it has become apparent that exposure to GBCAs can potentially result in gadolinium deposition within human bone and brain tissue even in the presence of normal renal function. This review will address some of the controversies surrounding the safety of GBCA administration based on evidence from in vivo experiments, animal studies and clinical studies. We additionally evaluate the potential risk of toxicity from exposure to gadolinium in light of new guidance published by the US Food and Drug Administration and the European Medicines Agency, and discuss whether gadolinium deposition disease exists as a new diagnosis.

Heavy Metal: Lead

Heavy Metal: Lead



Heavy Metal: Lead

- **Drinking water/ Soil contamination/ Dust**
- Toys
- Living near highways or airports
- **Homes built prior to 1978**
- Imported Pottery
- Food and herbs (imported)
- Car batteries (85% of lead globally is used in battery production)
- Ammunition / Air from indoor shooting ranges
- **Water pipes**
- **Lipstick/ Makeup**
- Cigarette Smoke
- **Jet Fuel**
- Toxic storage from lead based gasoline -banned in 1996

Source of Exposure: Lead

Environ Health Perspect. 2010 Feb; 118(2): A68–A74.
doi: 10.1289/ehp.118-a68
PMCID: PMC2831942
PMID: 20123629
News
Focus

Exposure on Tap: Drinking Water as an Overlooked Source of Lead

Rebecca Renner

Providence, Rhode Island, and Portland, Oregon, are two cities that by all accounts have well-run water utilities and health departments. Both have also had recurring problems with lead in tap water, yet both—according to some critics—have downplayed the potential importance of lead in tap water as a route of exposure. The experiences of these cities and others across the United States illustrate the difficulty not only of determining the causes behind specific cases of lead poisoning but also of ensuring that lead sources are eliminated.

Unlike most water contaminants, lead gets into water after it leaves a water treatment plant. Often this contamination is the result of water treatment changes meant to improve water quality that end up altering the water chemistry, destabilizing lead-bearing mineral scales that coat service lines and corroding lead solder, pipes, faucets, and fixtures. “Lead is a ‘close-to-home’ contaminant,” says Marc Edwards, an environmental engineer at Virginia Polytechnic Institute and State University. “That makes it very difficult to regulate and monitor.”

Under the U.S. Environmental Protection Agency’s (EPA) 1991 Lead and Copper Rule (LCR), municipal water utilities must sample a small number of homes at high risk for elevated lead levels, such as those known to have lead plumbing components. The size of the water system determines how many samples must be collected in each sampling period (the maximum required is 100), and the sampling interval can vary from 6 months to 3 years, depending on past compliance. The law requires that samples be “first-flush” water that has stood in pipes for a minimum of 6 hours. This scenario represents high but routine exposures to lead in tap water, because the longer corrosive water sits in contact with lead parts, the more lead leaches out. In many households, this worst-case normal-use scenario happens twice daily Monday through Friday: in the morning when the residents awake, and in the afternoon when they return home from work and school.

Lead Water Contamination

Review: Tainted Water, Bad Science and 8,000 Children Exposed to Lead

Flint water crisis

From Wikipedia, the free encyclopedia

The **Flint water crisis** was a public health crisis that started in 2014 and lasted until 2019,[2] after the drinking water for the city of Flint, Michigan was contaminated with lead and possibly *Legionella* bacteria.[1] In April 2014, during a budget crisis, Flint changed its water source from treated Detroit Water and Sewerage Department water (sourced from Lake Huron and the Detroit River) to the Flint River. Residents complained about the taste, smell, and appearance of the water. Officials failed to apply corrosion inhibitors to the water, which resulted in lead from aging pipes leaching into the water supply, exposing around 100,000 residents to elevated lead levels.[7] A pair of scientific studies confirmed that lead contamination was present in the water supply.[8][9] The city switched back to the Detroit water system on October 16, 2015.[10] It later signed a 30-year contract with the new Great Lakes Water Authority (GLWA) on November 22, 2017.[11]

On January 5, 2016, Michigan Governor Rick Snyder declared a state of emergency in Genesee County, of which Flint is the major population center. Shortly thereafter, President Barack Obama declared a federal state of emergency, authorizing additional help from the Federal Emergency Management Agency and the Department of Homeland Security.[12] Between 6,000 and 12,000 children were exposed to drinking water with high levels of lead.[4] Children are particularly at risk from the long-term effects of lead poisoning, which can include a reduction in intellectual functioning and IQ, and an increased chance of Alzheimer's disease. The water supply change was considered a possible cause of an outbreak of Legionnaires' disease in the county that killed 12 people and affected another 87, but the original source of the bacteria was never found.[13][14][15] Four government officials—one from the city of Flint, two from the Michigan Department of Environmental Quality (MDEQ), and one from the Environmental Protection Agency (EPA)—resigned over the mishandling of the crisis, and one additional MDEQ staff member was fired. Fifteen criminal cases have been filed against local and state officials,[16] but only one minor conviction has been obtained, and all other charges have been dismissed or dropped.

Source of Exposure: Lead

Original article

Evaluation of heavy metals in cosmetic products and their health risk assessment

Hamna Arshad [a], Moniba Zahid Mehmood [a], Munir Hussain Shah [b], Arshad Mehmood Abbasi [a]

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https://doi.org/10.1016/j.jsps.2020.05.006

Abstract

Heavy metals' contamination in cosmetic products is a serious threat. Present study was conducted to evaluate the concentrations of heavy metals (HMs) in various brands of cosmetic products with special emphasis on their health risk assessment. Five heavy metals including Cd, Cr, Fe, Ni and Pb were quantified in different brands of lotions, foundations, whitening creams, lipsticks, hair dyes and sunblock creams using atomic absorption spectrometry. Risk to the consumer's health was determined using systemic exposure dosage (SED), margin of safety (MoS), hazard quotient (HQ), hazard index (HI) and lifetime cancer risk (LCR).

On comparative basis, different brands of sunblock creams depicted highest concentration of Ni, Pb and Cr (7.99 ± 0.36, 6.37 ± 0.05 and 0.43 ± 0.01 mg/kg, respectively), whereas lipsticks had elevated levels of Fe at 12.0 ± 1.8 mg/kg, and Cd was maximum in lotions (0.26 ± 0.02 mg/kg). Multivariate analysis revealed strong associations among Cr, Ni and Pb, while Cd and Fe showed disparity in distribution

Health Impacts of Lead

CLEAN WATER ACTION
CLEAN WATER FUND

Exposure to high levels of lead can cause severe damage to the brain, blood and kidneys. Children under six are most at risk from lead poisoning. Even low levels of lead exposure have been found to permanently reduce cognitive ability and cause hyperactivity in children.

ADULTS

Brain
Memory loss, lack of concentration, headaches, irritability, depression.

Body
Fatigue, joint and muscle pain

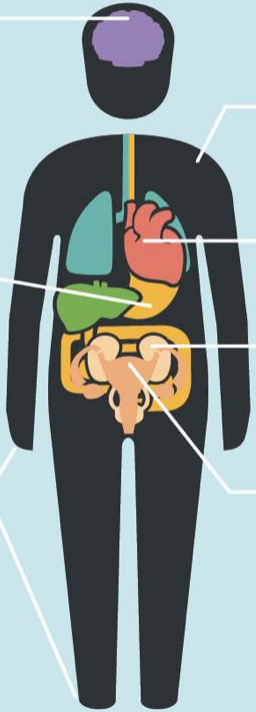
Cardiovascular
High blood pressure

Digestive System
Constipation, nausea and poor appetite

Kidneys
Abnormal function and damage

Nervous System
Damage including numbness and pain in the extremities

Reproductive System
Men: Decreased sex drive and sperm count, and sperm anomalies. Women: Spontaneous miscarriage



CHILDREN

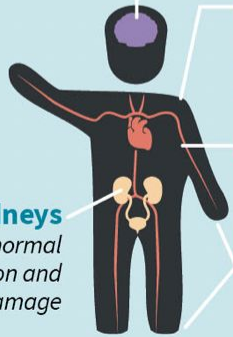
Brain
Behavior problems, lower IQ, hearing loss, learning disabilities

Body
decreased bone and muscle growth

Blood
Anemia

Kidneys
Abnormal function and damage

Nervous System
Damage



Lead: Health Impact

Environmental Research
Volume 47, Issue 1, October 1988, Pages 79-94

Lead and osteoporosis: Mobilization of lead from bone in postmenopausal women

Ellen K. Silbergeld *, Joel Schwartz †, Kathryn Mahaffey ‡

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https://doi.org/10.1016/S0013-9351(88)80023-9

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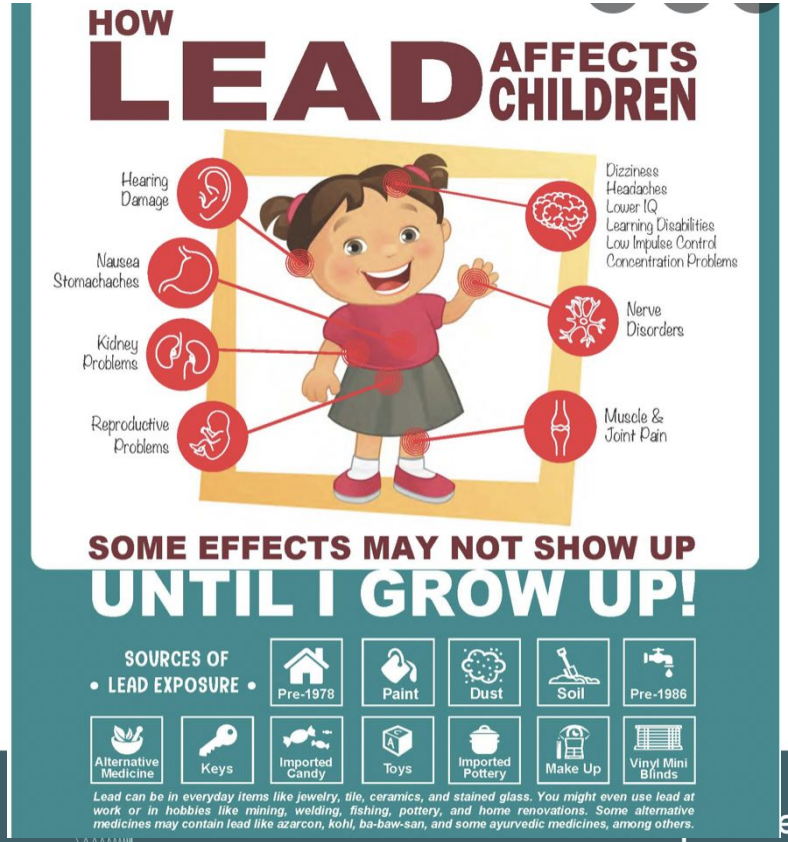
Although it has been known that humans accumulate lead in bone, mineralized tissue has been considered primarily as a sequestering compartment and not as a site of toxic action for lead. However, experimental data indicate that bone lead can be released during conditions of demineralization, such as pregnancy and lactation. We have examined lead status in women, before and after menopause, using the NHANES II dataset compiled between 1976 and 1980. In 2981 black and white women there was a highly significant increase in both whole blood and calculated plasma lead concentrations after menopause. The results indicate that bone lead is not an inert storage site for absorbed lead. Moreover, lead may interact with other factors in the course of postmenopausal osteoporosis, to aggravate the course of the disease, since lead is known to inhibit activation of vitamin D, uptake of dietary calcium, and several regulatory aspects of bone cell function. The consequences of this mobilization may also be of importance in assessing the risks of maternal lead exposure to fetal and infant health.

Lead: Health Impact



ELSEVIER

Toxicology Letters
Volume 66, Issue 1, January 1993, Pages 105-112

Impairment of long-term potentiation and learning following chronic lead exposure

Lilo Altmann, Frank Weinsberg, Karolina Sveinsson, Hellmuth Lilienthal, Herbert Wiegand, Gerhard Winneke

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https://doi.org/10.1016/0378-4274(93)90085-C

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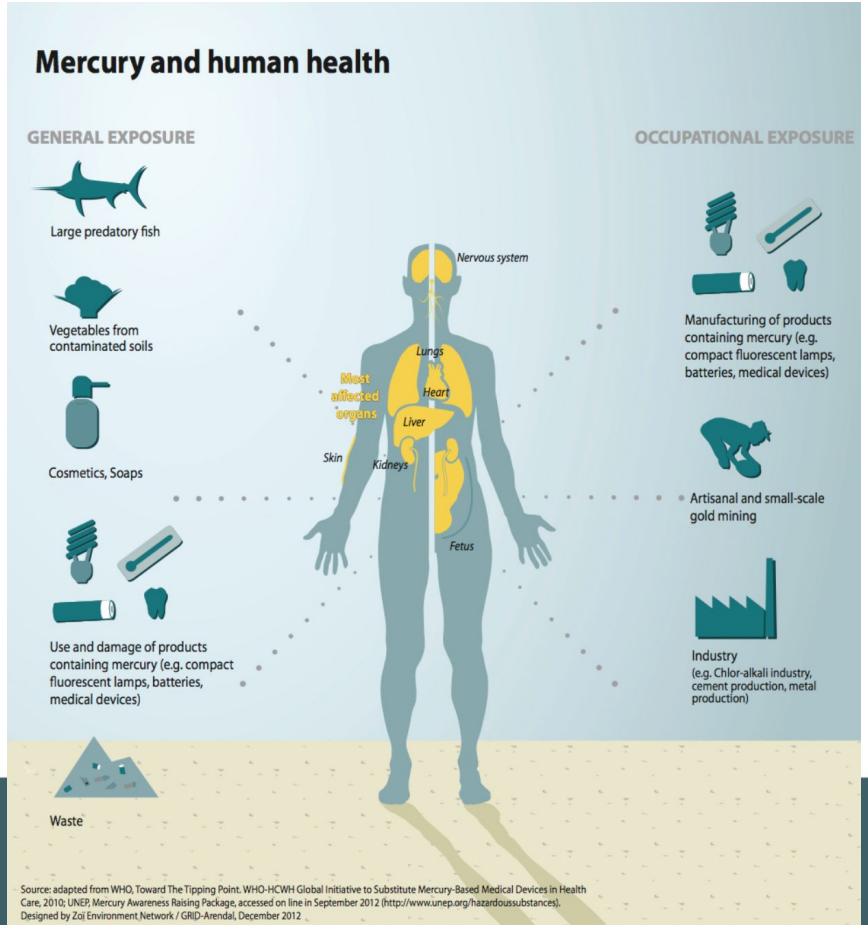
Abstract

Chronic lead exposure during brain development is known to affect functions of the central nervous system. We exposed rats chronically to low levels of lead at different developmental stages in order to determine the most sensitive periods of the exposure. Active avoidance learning and hippocampal longterm potentiation were tested in the same animals. If the exposure period comprised the prenatal and the early postnatal phase and was continued into adulthood, learning as well as long-term potentiation were impaired. Starting the exposure not before 16 days postnatally, however, neither affected learning nor hippocampal potentiation. These results reflect the higher vulnerability of the immature as compared to the mature hippocampus to lead-induced functional deficits.

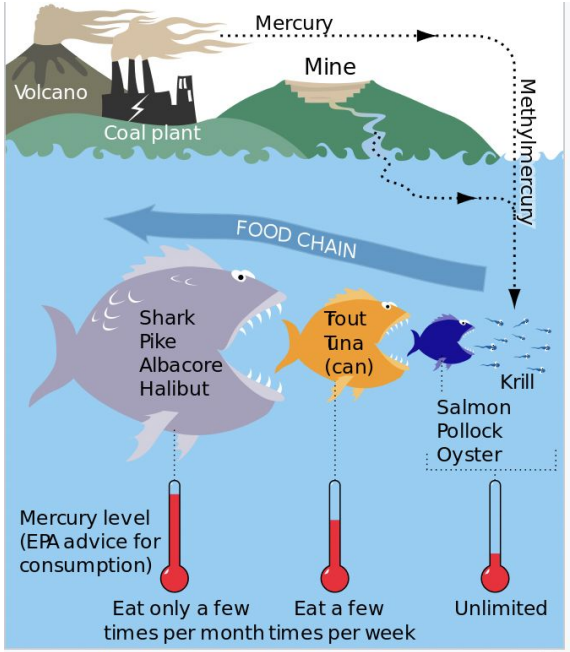
Heavy Metal: Mercury

Heavy Metal: Mercury



DR. HYMAN+

Exposure: Mercury



Nearby anthropogenic sources, such as coal burning and mining of iron, can contaminate water sources with methylmercury, which is efficiently absorbed in the bodies of fish. Through the process of biomagnification, mercury levels in each successive predatory stage increase.

Contaminated Fish:

- Tuna
- Shark
- Orange Roughy
- Halibut
- Croaker
- Perch
- Grouper
- Bluefish
- Largemouth Bass
- Walleye
- Swordfish
- Marlin

Heavy Metal: Mercury

- **Fish**
- **Amalgam fillings**
- **Vaccines from Multi-Dose Vials**
- Beauty Products
- Herbal products from Southeast Asia
- Red tattoo dye
- Broken fluorescent light bulbs
- Barometers / Thermometers
- Vases
- **Bleaching creams**

*Presence of the following genetic SNP's have been correlated with increased levels of mercury:

- GSTT1
- GSTM1
- GSTP1

Different types of mercury

- Inorganic Mercury = Amalgams
- Methylmercury = fish
- Ethylmercury = vaccines

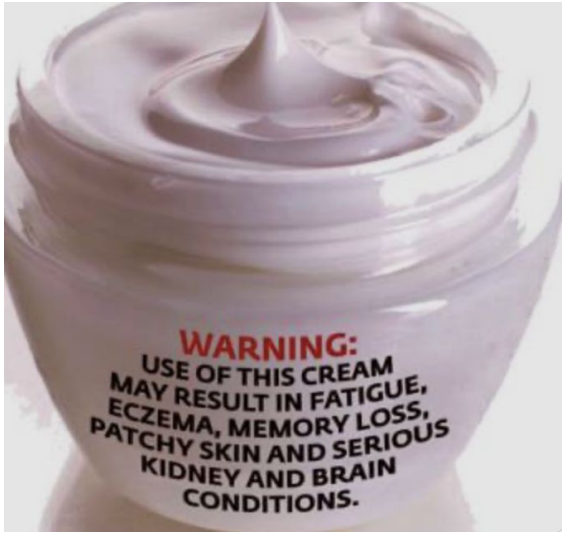
Exposure: Mercury

World Health Organization

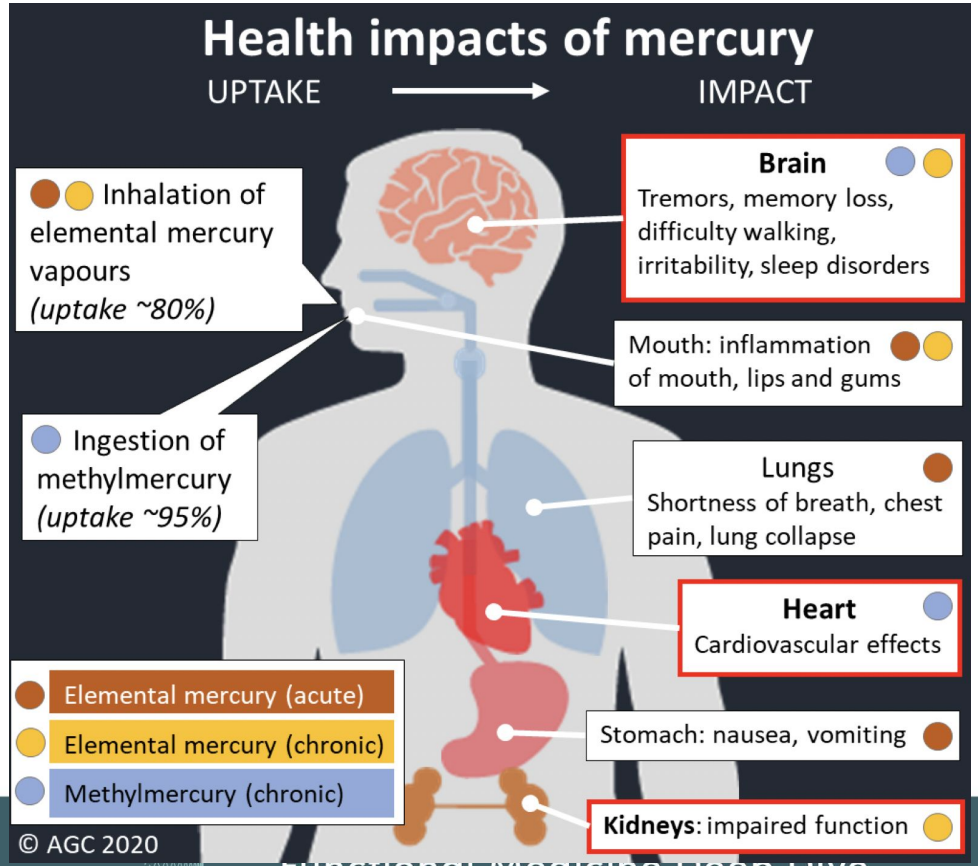
MERCURY IN SKIN LIGHTENING PRODUCTS

Mercury is a common but dangerous ingredient found in skin lightening creams and soaps. Beauty standards promoted by media, advertising and marketing reinforce the bias that lighter skin tone is more desirable than darker skin tone. Skin lightening creams and soaps are commonly used in many African, Asian and Caribbean nations *(1, 2)*. They are also used among dark-skinned populations in Europe and North America *(3–5)*. Mercury salts inhibit the formation of melanin, resulting in a lighter skin tone *(6, 7)*. The Minamata Convention on Mercury establishes a limit of 1 mg/kg (1 ppm) for skin lightening products *(8)*, yet many cosmetic products contain mercury levels higher than that amount to increase whitening effect *(9, 10)*. Despite having been banned in many countries, mercury-containing products are often easily obtainable *(11)*.

Mercury can be eliminated from skin lightening products by working with health and environmental ministries and raising public awareness about the dangers to health from mercury and other hazardous chemicals in skin lightening products. To stop the manufacture, import and export of skin lightening products in line with the Minamata Convention, regulatory actions by governments are needed – including training of customs agents – as well as major media and advocacy campaigns.



Mercury Health Impact



Toxic Effects of Mercury on the Cardiovascular and Central Nervous Systems

Bruna Fernandes Azevedo, [1,*] Lorena Barros Furieri, [1] Franck Maciel Peçanha, [2] Giulia Alessandra Wiggers, [3] Paula Frizera Vassallo, [4] Maylla Ronacher Simões, [1] Jonaina Fiorim, [1] Priscila Rossi de Batista, [1] Mirian Fioresi, [5] Luciana Rossoni, [6] Ivanita Stefanon, [1] María Jesus Alonso, [7] Mercedes Salaices, [8] and Dalton Valentim Vassallo [1,9]

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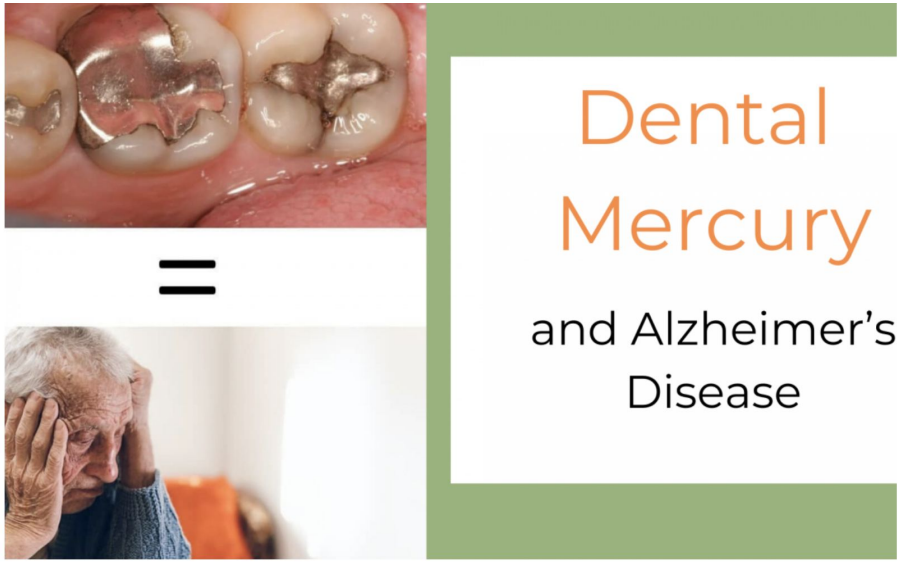
Abstract Go to:

Environmental contamination has exposed humans to various metal agents, including mercury. This exposure is more common than expected, and the health consequences of such exposure remain unclear. For many years, mercury was used in a wide variety of human activities, and now, exposure to this metal from both natural and artificial sources is significantly increasing. Many studies show that high exposure to mercury induces changes in the central nervous system, potentially resulting in irritability, fatigue, behavioral changes, tremors, headaches, hearing and cognitive loss, dysarthria, incoordination, hallucinations, and death. In the cardiovascular system, mercury induces hypertension in humans and animals that has wide-ranging consequences, including alterations in endothelial function. The results described in this paper indicate that mercury exposure, even at low doses, affects endothelial and cardiovascular function. As a result, the reference values defining the limits for the absence of danger should be reduced.

Mercury Health Impact



[Mercury and Alzheimer's disease]

[Article in German]
J Mutter [1], J Naumann, R Schneider, H Walach

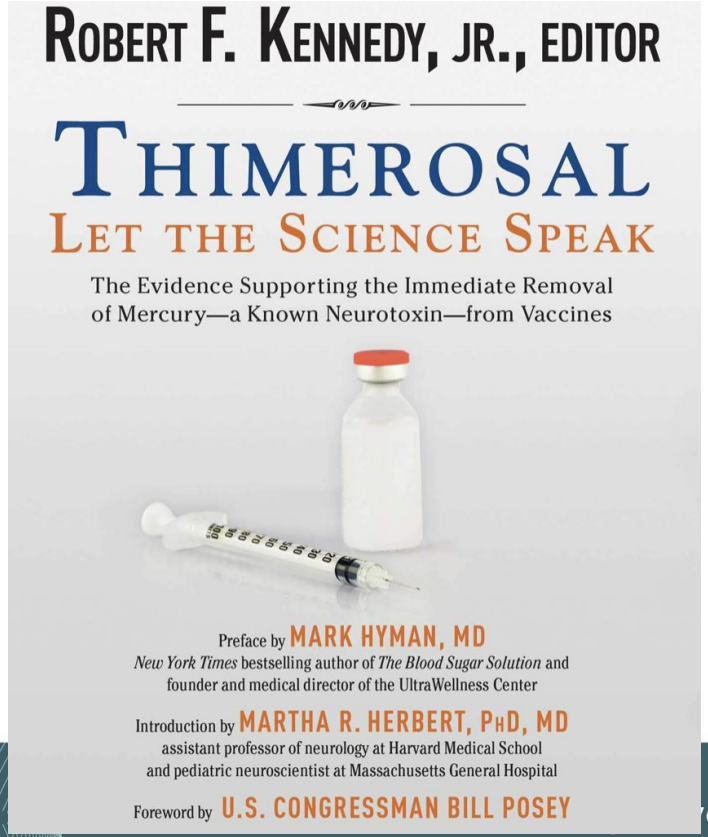
Affiliations + expand

PMID: 17628833 DOI: 10.1055/s-2007-959237

Abstract

Higher mercury concentrations were found in brain regions and blood of some patients with Alzheimer's disease (AD). Low levels of inorganic mercury were able to cause AD- typical nerve cell deteriorations in vitro and in animal experiments. Other metals like zinc, aluminum, copper, cadmium, manganese, iron, and chrome are not able to elicit all of these deteriorations in low levels, yet they aggravate the toxic effects of mercury (Hg). Main human sources for mercury are fish consumption (Methyl-Hg) and dental amalgam (Hg vapour). Regular fish consumption reduces the risk of development of AD. Amalgam consists of approx. 50 % of elementary mercury which is constantly being vaporized and absorbed by the organism. Mercury levels in brain tissues are 2 - 10 fold higher in individuals with dental amalgam. Persons showing a genetically determined subgroup of transportation protein for fats (apolipoprotein E4) have an increased AD risk. Apoliprotein E (APO E) is found in high concentrations in the central nervous system. The increased AD risk through APO E4 might be caused by its reduced ability to bind heavy metals. Latest therapeutic approaches to the treatment of Alzheimer disease embrace pharmaceuticals which remove or bind metals from the brain. Preliminary success has been documented with chelation of synergistic toxic metals (Fe, Al, Zn, Cu) and therefore also Hg. The available data does not answer the question, whether mercury is a relevant risk factor in AD distinctively. In sum, the findings from epidemiological and demographical studies, the frequency of amalgam application in industrialized countries, clinical studies, experimental studies and the dental state of Alzheimer patients in comparison to controls suggest a decisive role for inorganic mercury in the etiology of Alzheimer's disease. Other factors currently discussed as causes (e. g. other metals, inflammations, dietetic factors, vitamin deficiency, oxidative distress, and metabolic impairments) may act as co-factors.

Mercury Health Impact



Environ Health Perspect. 2005 Aug; 113(8): A543–A544. PMCID: PMC1280369
Environews
Science Selections

Thimerosal and Animal Brains: New Data for Assessing Human Ethylmercury Risk

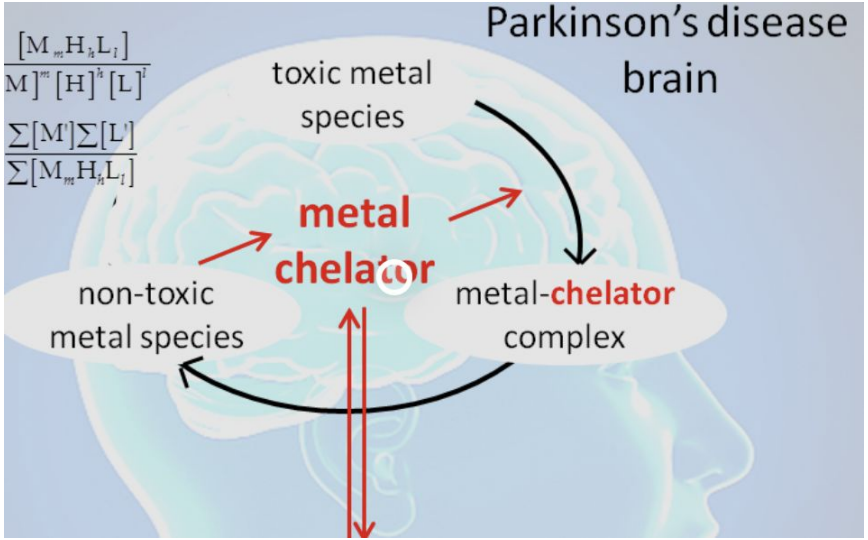
Julia R. Barrett

See "Comparison of Blood and Brain Mercury Levels in Infant Monkeys Exposed to Methylmercury or Vaccines Containing Thimerosal" in volume 113 on page 1015.

Since the 1930s, vaccines have contained thimerosal, a mercury-based preservative that breaks down to ethylmercury and thiosalicylate in the body. By some calculations, children given the usual schedule of vaccines containing thimerosal receive ethylmercury in doses exceeding the U.S. Environmental Protection Agency's guidelines for methylmercury, a known neurotoxicant. Because of the lack of pharmacokinetic and toxicity data for ethylmercury, methylmercury has been used as a reference for ethylmercury toxicity based on the assumption that the two compounds share similar toxicokinetic profiles. However, a new animal study shows that methylmercury is an inadequate reference for ethylmercury due to significant differences in tissue distribution, clearance rates, and ratios of organic to inorganic mercury in the brain **[*EHP* 113:1015–1021]**.

During their first two years, children in the United States may receive more than 20 routine vaccinations. The rise in childhood autism has sparked concerns that thimerosal-derived ethylmercury may be at least partly to blame for some of these cases—concerns that are largely driven by awareness of methylmercury's neurotoxicity. Beginning in 1999 thimerosal-free versions of routine vaccines for children under age 6 started becoming available. However, as of winter 2005, the flu vaccine still contained thimerosal, and the preservative continues to be used in vaccines in other countries.

Mercury Health Impact



Epidemiologic study on the association between body burden mercury level and idiopathic Parkinson's disease

C H Ngim [1], G Devathasan

Affiliations + expand

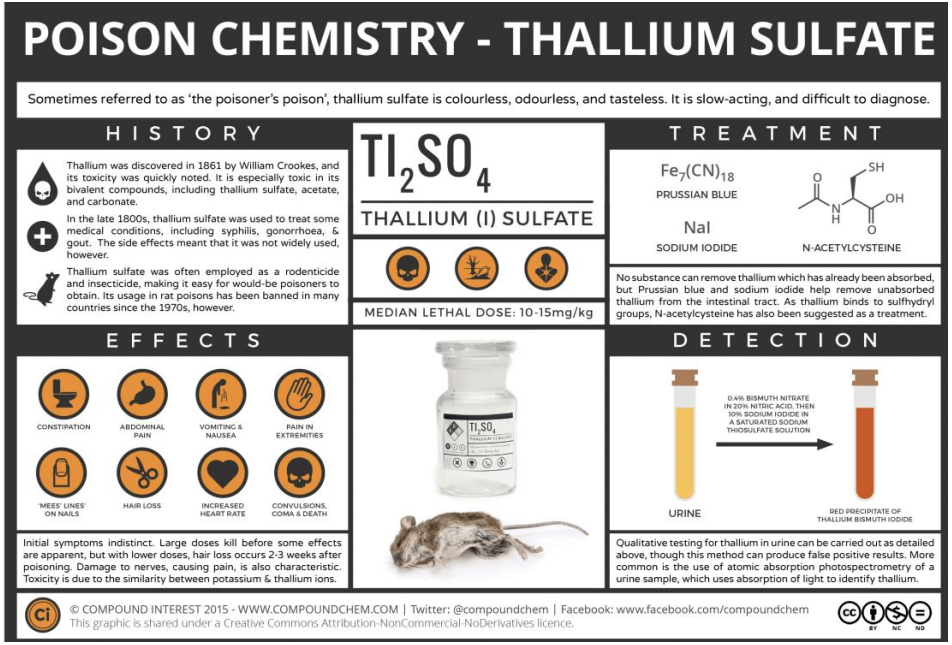
PMID: 2725805 DOI: 10.1159/000110175

Abstract

A case-control study was conducted among the multiethnic population of Singapore to test the hypothesis that a high level of body burden mercury is associated with an increased risk of Parkinson's disease (PD). Selected factors investigated that could contribute to the body burden of mercury included dietary fish intake, ethnic over-the-counter medications, occupational exposures and possession of dental amalgam fillings. Detailed interviews were completed in 54 cases of idiopathic PD and 95 hospital-based controls, matched for age, sex and ethnicity, between July 1985 and July 1987. After adjusting for potential confounding factors, including dietary fish intake, medications, smoking and alcohol consumption, there was clear monotonic dose-response association between PD and blood mercury levels. The odds ratios (OR) and 95% confidence intervals (CI) for the approximate subject tertiles based upon blood mercury levels were 8.5 (CI = 2.2-33.2) and 9.4 (CI = 2.5-35.9), relative to the tertile with lowest blood mercury levels (less than 5.8 ng Hg/ml). Similar associations were revealed using scalp hair and urinary mercury levels. However, only the comparisons between the highest and lowest tertiles were statistically different from unity (p less than 0.05). When the body burden mercury indicators were mutually adjusted in addition to the four confounding factors, blood and urinary mercury levels showed ORs of 21.00 and 18.65, respectively. These ORs were statistically different from unity (p less than 0.05, 2-sided test). After adjustment, scalp hair mercury was shown to be a poor predictor of PD risk.

Heavy Metal: Thallium

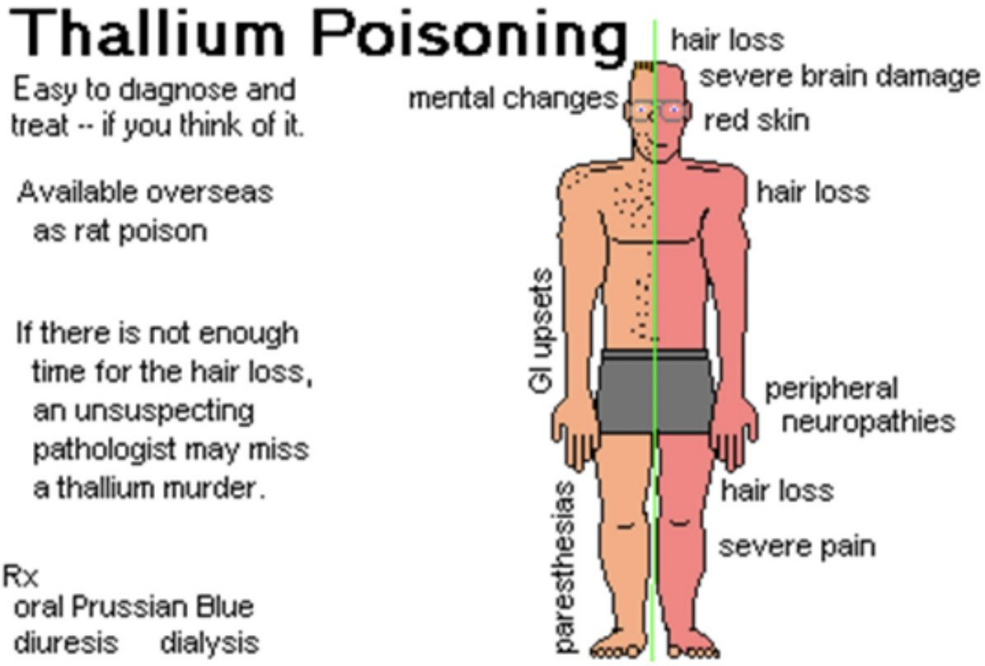
Heavy Metal: Thallium



Heavy Metal: Thallium

- Water contamination- Drinking Water
- Air pollution
  - Coal Combustion
  - Cement Plants
- Brassica family of vegetables bioconcentration from polluted water or soil
  - **Kale,** Cabbage, Spinach, Brussel Sprouts, Greens powders
- Fish from contaminated water sources
- Thallium has a **negative impact on the neurological system leading to paresthesias and neuropathies**. It also causes **hair loss, fatigue, brain fog** and kidney damage

Thallium: Health Impact



Thallium toxicity in humans

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Affiliations + expand

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Free article

Abstract

Thallium is a naturally occurring trace element, widely distributed in the earth's crust, but at very low concentrations. It does not have a known biological use and does not appear to be an essential element for life. It has been considered one of the most toxic heavy metals.Occasionally, there are reports on thallium poisoning as results of suicide or murder attempt or accident. The main threat to humans is through occupational exposure, environmental contamination, and accumulation in food, mainly in vegetables grown on contaminated soil. Increasing use in emerging new technologies and demanding high-tech industry constantly raise concern about exposure risk to all living organisms. Thallium is considered a cumulative poison that can cause adverse health effects and degenerative changes in many organs. The effects are the most severe in the nervous system. The exact mechanism of thallium toxicity still remains unknown, although impaired glutathione metabolism, oxidative stress, and disruption of potassium-regulated homeostasis may play a role. The lack of data about mutagenic, carcinogenic, or teratogenic effects of thallium compounds in humans calls for further research.

Multi-Metal Sources

- Orthopedic implants
  - Cobalt
  - Nickel
  - Chromium
  - Titanium
- Stainless Steel
- Total Joint Arthroplasty
  - Cobalt-chromium alloy
- Pacemakers
  - Aluminum, Nickel, Titanium, Gold
- IUD's
  - Copper, Manganese, Nickel, Titanium, Zinc

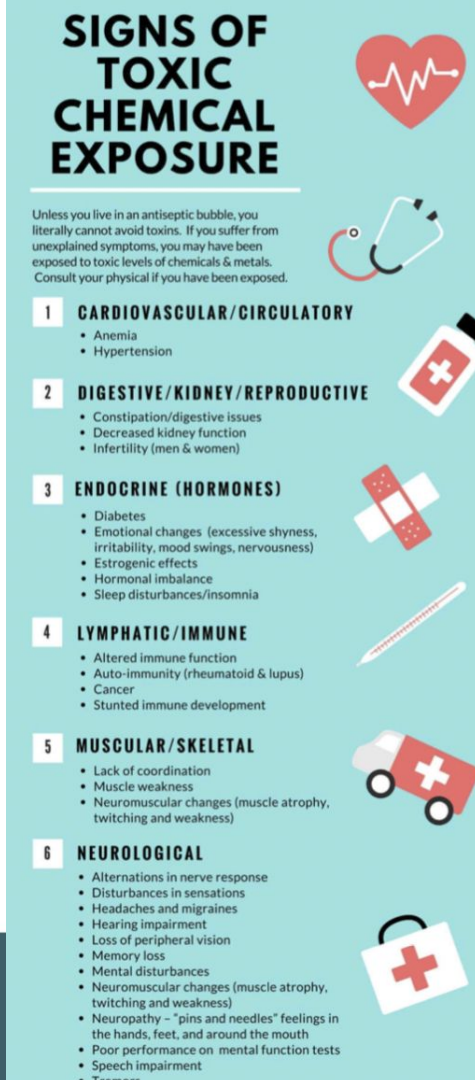
Heavy Metals: How Do They Impact Us?

Affected Organ Systems

- Toxic metals can affect every organ system in the body
- Most commonly affected systems include:
  - Neurological
  - Endocrine
  - Cardiovascular
  - Gastrointestinal
  - Urinary
  - Hepatobiliary
  - Skeletal
- Both current and past exposures can contribute to health conditions because some toxic metals (lead, cadmium, mercury, cesium, aluminum) can build up in organs and tissues from exposures that occurred years to decades earlier.

Heavy Metals Impact

nal Medicine Deep Dive



Common Presenting Symptoms

- Brain Fog
- Fatigue
- Muscle Pain
- Hair Loss
- Neuropathies
- Electricity-like pains
- Insomnia
- High blood pressure
- Difficult concentrating and learning
- Stomach pain, loose stools, constipation
- Skin rashes
- Heart Palpitations
- Slower metabolism
- Weak nails
- Balance problems
- Tremors/Twitches
- Anxiety
- Alternating moods
- Weak immune system
- Vertigo
- Odd taste in mouth
- Memory loss
- Headaches
- Bone loss

Diving Deeper

Toxic metals cause damage through a variety of mechanisms including:

- Free radical generation that may cause mitochondrial toxicity
- DNA cellular damage
- Changes in glutathione production resulting in deficiency
- Depletion of minerals and B vitamins
- Alter hormone receptors causing hormonal imbalances
- Increase liver and kidney toxic burden causing cellular damage
- Alter nerve function and signaling
- Weaken the immune system, allowing for candida overgrowth

Diving Deeper

- Enzyme inactivation
  i. EX: Lead causes disruption of enzymes involved in heme synthesis which may lead to anemia and consequences beyond the blood.

- Metals like mercury or cadmium replace zinc, magnesium, or other minerals in the mineral moiety of the enzyme rendering it nonfunctional.

- Immune sensitization- this occurs through antibody production or lymphocyte sensitization.
  i. EX: Systemic dermatitis caused by nickel allergy is a common example.

Heavy Metals and Specific Health Conditions

- Cardiovascular disease mortality
  - Urine cadmium levels > 0.57mcg/g increased risk for all cause mortality and coronary heart disease mortality.
- Osteoporosis
  - Urine cadmium levels > 0.50mcg/g = increased risk of osteoporosis in women over 50.
- Autoimmunity
  - Blood mercury levels >1.8 mcg/L = higher likelihood of elevated thyroglobulin antibodies leading to Hashimoto's Disease AND higher levels of ANA leading to Lupus, Sjogren's, Raynaud's, and more.

Heavy Metals: Testing

Heavy Metals: How Do We Test?

- Appropriate testing depends on
  - The type of metal or form of metal
  - Symptoms and signs
  - Acute poisoning vs. Chronic exposure

- Urine Provocation Test is the Gold Standard
- Blood Metal Levels in red blood cells

Heavy Metals: The Provocation Test

- The **most accurate type** of metal testing is via urine with BOTH a pre-provocation and post-provocation sample collection
- **Pre-provocation** (Acute Exposure) = urine from body without chelator
- **Post-provocation** (Chronic Exposure) = urine in the hours following a chelation agent (EDTA, DMSA, DMPS) to pull storage from tissues- six hour test
- **Doctor's Data- Urine Test**

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	0.9	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	18	< 80	
Barium	(Ba)	1.3	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 4	
Cadmium	(Cd)	0.08	< 1	
Cesium	(Cs)	5.7	< 10	
Gadolinium	(Gd)	< dl	< 0.8	
Lead	(Pb)	0.2	< 2	
Mercury	(Hg)	2.3	< 4	
Nickel	(Ni)	2.9	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.1	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	0.1	< 5	
Tungsten	(W)	0.04	< 0.4	
Uranium	(U)	< dl	< 0.04	

PRE-PROVOCATION

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	< dl	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	17	< 80	
Barium	(Ba)	0.6	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 4	
Cadmium	(Cd)	0.3	< 1	
Cesium	(Cs)	9.5	< 10	
Gadolinium	(Gd)	< dl	< 0.8	
Lead	(Pb)	6.7	< 2	
Mercury	(Hg)	30	< 4	
Nickel	(Ni)	1.6	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.3	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	0.5	< 5	
Tungsten	(W)	0.2	< 0.4	
Uranium	(U)	< dl	< 0.04	

POST-PROVOCATION

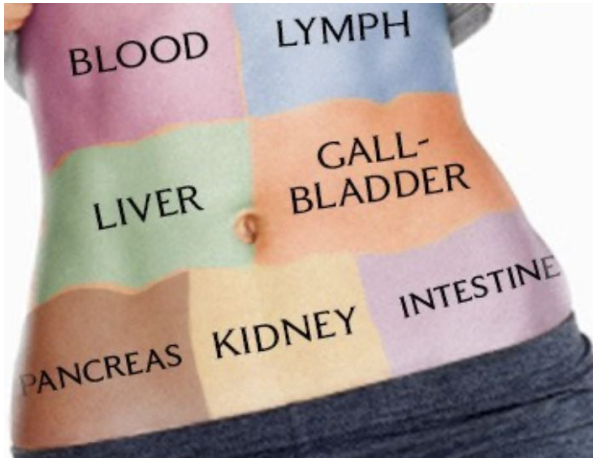
Heavy Metals: Detoxing & Treatment

AVOIDANCE

- Detox can only get you so far if you are still being consistently exposed to heavy metals
- Test well and tap water for arsenic, lead, thallium, and chromium- Doctor's Data
- Use reverse osmosis water filters
- Avoid mercury-containing fish
- Determine if you are living next to a nearby industrial site
- Avoid brassica vegetables from California and other states with high fracking sites
- Removal of amalgam fillings

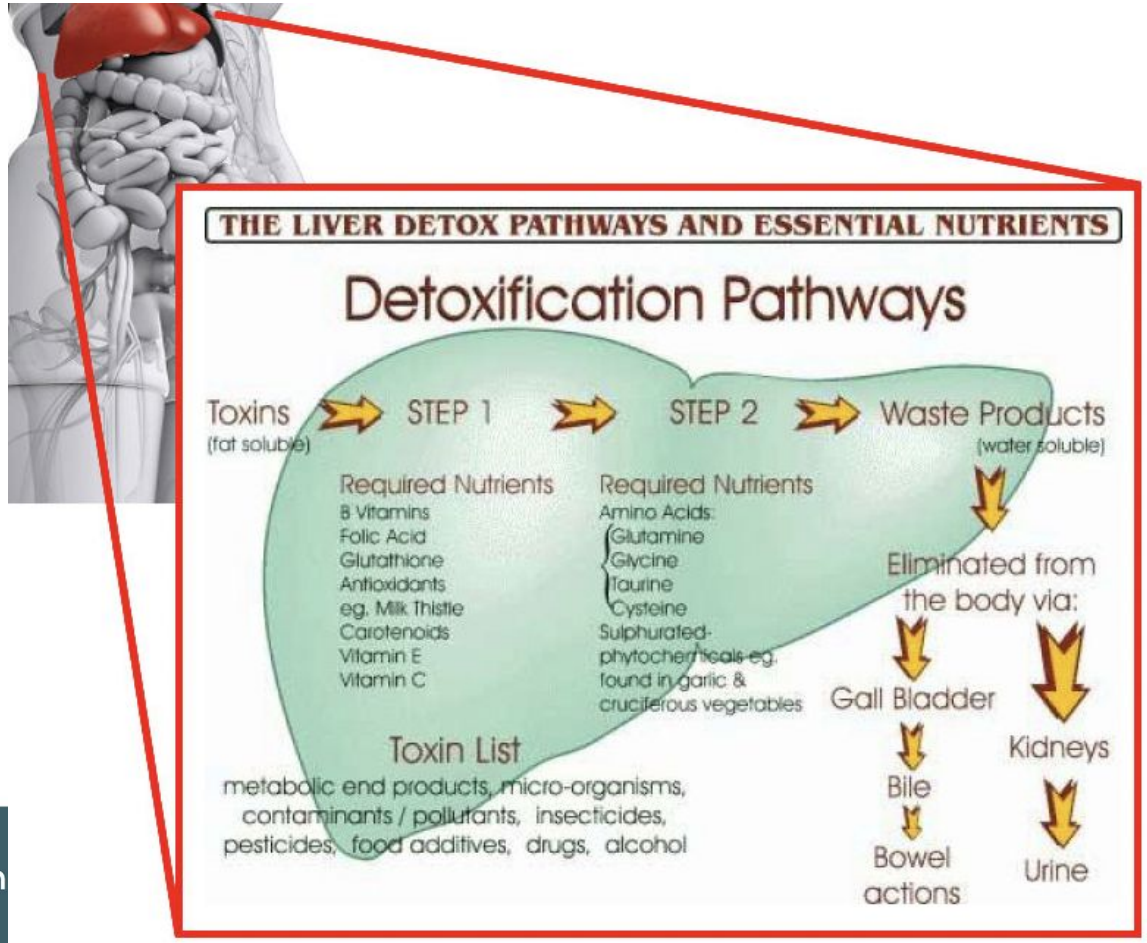
Understanding Detox Pathways & Elimination

- **Detox pathways include:**
  - **Liver** (Major organ of detoxification by changing the molecular state of the toxin so that it can be excreted- Phase I and Phase II)
  - **Gallbladder** (Bile)
  - **Kidneys** (Urine)
  - **Bowels** (Feces)
  - **Lungs** (Breath)
  - **Skin** (Sweat)
  - **Lymphatics** (Blood)



- Support all Pathways before **Chelation**

Liver Detox Pathways



A Whole Body Approach to Treatment

- **Support the Liver**- Liposomal **Glutathione**/NAC/Alpha Lipoic Acid/B Vitamins/Liver Herbs (milk thistle, artichoke, turmeric)
- **Support the Kidneys**- Hydration/Minerals/Electrolytes/Kidney Herbs (dandelion, nettles, solidago)
- **Support the Gut-** Probiotics/ Digestive Enzymes/Colonics/Clean Diet
- **Bind Metals** (Binders)- Activated Charcoal/Silica/Zeolite Clay/Bentonite Clay/Apple Pectin/Humic and Fulvic Acid/ Chlorella
- **Move the Blood/Lymph**- Sauna/ Skin Brushing/Exercise/Rebounder
- Use a **Chelator Binder** depending on the metal only with the guidance of a physician trained on chelation

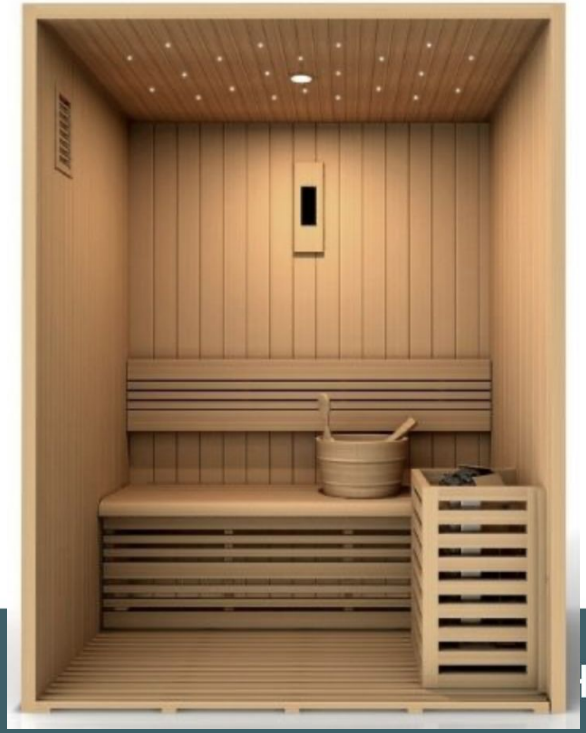
Raise Glutathione Levels Naturally

Your body synthesizes glutathione from three amino acids: cysteine, glutamate, and glycine. Fruits and vegetables, particularly **avocado, asparagus, grapefruit, strawberries, tomato, artichokes, cantaloupe, broccoli, okra, peach, zucchini, and spinach** are rich in the precursors glutamate and glycine. Dietary sources of cysteine include **eggs, meat, red peppers, garlic, onions, brussels sprouts, broccoli and cabbage.** Other helpful treatments for improved glutathione metabolism include:

- Exercise: Exercise affects your adenosine triphosphate (ATP) levels needed to help produce glutathione
- Epsom salt baths
- The supplement N-acetyl L-cysteine (NAC) helps build glutathione. NAC is the rate-limiting nutrient for the formation of the intracellular antioxidant glutathione

Sauna

- Key treatment for METALS that are eliminated via the skin/sweat
- Infrared Sauna prefer method of sweating- 30 minutes at a time- always end with cold shower- 2-3X a week
    - Cadmium
    - Mercury
    - Lead
    - Antimony
    - Arsenic
    - Nickel
    - Aluminum
    - Chromium
    - Uranium



Foods to Support Heavy Metal Detox

- Celery Juice
- Blueberries
- Cilantro
- Parsley
- Radishes
- Garlic
- Spirulina
- Chlorella
- Grapes
- Apples

Foods to Support Heavy Metal Detox

- Bone Broth
- Garlic
- Chia Seeds
- Flax Seeds
- Turmeric
- Ginger
- Hydration
- High Vitamin C Foods
- High Fiber Foods

Heavy Metal Detox Smoothie

- 2 Bananas or Mango
- 2 cups of Organic Blueberries
- 1 tsp of Acai Powder
- ½ cup of organic cilantro
- 1 tsp of Spirulina
- 1 tsp Barley Grass Juice Powder
- 1 small handful of Organic Atlantic Dulse

Binding Heavy Metals: Chelation

Chelation Agents

- Pharmaceutical agents that bind heavy metals in order to be excreted
- Limitations include that these agents cannot cross the blood brain barrier, therefore do not bind metals in the brain.
  - Provocation urine levels do not reflect brain levels
- When is it necessary?
  - For metals that have long half lives and live in the body for an extended period of time
    - Mercury - stored in brain and kidneys
    - Lead/Cadmium - stored in bone, liver, kidneys
  - Acute metal poisoning

Brain Metal Detox

Preferred Chelators for Different Metals

Metal	First Choice	Second Choice
Al	Deferoxamine	
Inorg. Hg	DMPS	DMSA
Org. Hg	DMSA/ DMPS	
Pb	DMSA/EDTA	DMPS
As	DMPS	DMSA
Cd	EDTA	DMPS
Sb	DMPS/DMSA	EDTA
Sn	DMPS, DMSA	EDTA
Tl	Prussian Blue	DMSA
Gd	EDTA	
Co	EDTA	

Heavy Metals: Case Studies

First Case Study:

Chronic Thallium Poisoning

A 39-Year Old Female w/ Thallium Poisoning

Presents with chief concerns of:

- Neuropathy, intense nerve pain throughout body
- Dizziness
- Hair loss including eyelashes
- Fatigue
- Chest pressure, and feelings of choking.

All symptoms come and go and had been worsening over the past 4 years.

A 39-Year Old Female w/ Thallium Poisoning

She reports experiencing:

- Neurological flare ups with severe brain fog that last for days
- For the past two years she started getting kidney pain, UTI's, kidney stones, and her GFR was dropping
- All urine analysis were positive for blood for the past two years
- Waking up most days with nausea and taste of ammonia in her mouth, and a feeling of sensitivity in her teeth
- Heart palpitations and random increases of heart rate when seated
- She reports feeling better after doing sauna.

A 39-Year Old Female w/ Thallium Poisoning

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	6.6	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	16	< 80	
Barium	(Ba)	1.3	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 4	
Cadmium	(Cd)	0.3	< 1	
Cesium	(Cs)	7.7	< 10	
Gadolinium	(Gd)	< dl	< 0.8	
Lead	(Pb)	0.4	< 2	
Mercury	(Hg)	< dl	< 4	
Nickel	(Ni)	3.5	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	4.8	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	< dl	< 5	
Tungsten	(W)	0.09	< 0.4	
Uranium	(U)	< dl	< 0.04	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	58.1	30- 225	

PRE-PROVOCATION

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	4.8	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	19	< 80	
Barium	(Ba)	2.2	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 4	
Cadmium	(Cd)	< dl	< 1	
Cesium	(Cs)	12	< 10	
Gadolinium	(Gd)	< dl	< 0.8	
Lead	(Pb)	7	< 2	
Mercury	(Hg)	3.4	< 4	
Nickel	(Ni)	4.5	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	14	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	0.8	< 5	
Tungsten	(W)	< dl	< 0.4	
Uranium	(U)	< dl	< 0.04	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	15.2	30- 225	

POST-PROVOCATION

Treatment

- **Identified major exposure:** Kale and organic brassica consumption and green powders avoided
- **Prussian Blue** - Chelator Agent (4 rounds- 5 days each- over course of 6 months- one month apart)
- **Glutathione Infusions and Liposomal Oral Support**
- **Sauna** three times a week- 30 minutes at a time
- **Binders** such as GI Detox / Ultra Binder / Charcoal / Silica- three times a week for 6 months
- **Colonics-** once a week
- **Increase Fiber** Intake daily
- Stopped eating KALE!!!

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	6.2	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	6.5	< 80	
Barium	(Ba)	0.5	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 4	
Cadmium	(Cd)	0.4	< 1	
Cesium	(Cs)	4.7	< 10	
Gadolinium	(Gd)	< dl	< 0.8	
Lead	(Pb)	0.2	< 2	
Mercury	(Hg)	0.4	< 4	
Nickel	(Ni)	1.3	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.3	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	0.2	< 5	
Tungsten	(W)	0.09	< 0.4	
Uranium	(U)	< dl	< 0.04	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	91.2	30- 225	

PRE-PROVOCATION

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	10	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	9.3	< 80	
Barium	(Ba)	2	< 7	19
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 4	
Cadmium	(Cd)	< dl	< 1	
Cesium	(Cs)	9.1 (12)	< 10	
Gadolinium	(Gd)	< dl	< 0.8	
Lead	(Pb)	7.6 (7)	< 2	
Mercury	(Hg)	4.7 (3.4)	< 4	
Nickel	(Ni)	3.5 4.5	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.7 (14)	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	1.1	< 5	
Tungsten	(W)	< dl	< 0.4	
Uranium	(U)	< dl	< 0.04	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	19.2	30- 225	

POST-PROVOCATION

Patient Response to Treatment

One year Follow Up: patient is no longer symptomatic. She reports 95% improvement in all symptoms. From time to time she feels mild dizziness which resolves after taking charcoal. Liver enzymes have been stable for over 18 months with no fluctuations. EKG is back to normal. UA no longer shows blood. Kidney function has been stable. No longer experiences heart palpitations or fatigue. Hair loss is fully resolved, nerve pain is gone, no longer has neuropathies.

Second Case Study:

Chronic Mercury Poisoning

A 38-year old male w/ Mercury Poisoning

38 year old Male presents with:

- **Fatigue** for 1 year
- **Brain Fog**, trouble concentrating
- **Chronic Sinus Infections**
- Abdominal **Bloating and Gas**
- **Loose Stools**
- **Elevated Triglycerides and Liver Enzymes**
- **Inability to gain weight**
- He reports in the last year he had **4 amalgams removed** and felt worse after removal of amalgams- he did not see a biological dentist- also reports **episodes of dizziness** since then
- On clinical history he reports- having **8 amalgams done by age 18**-
- Eats sushi weekly, organic diet, exercises regularly, likes to hike and camp

Testing Revealed

Parasites			
Protozoa	Result		Normal
Blastocystis hominis	**<dl**		<2.00e3
Chilomastix mesnili	**<dl**		<1.00e5
Cyclospora spp.	**<dl**		<5.00e4
Dientamoeba fragilis	**9.75e5**	**High**	<1.00e5
Endolimax nana	**<dl**		<1.00e4
Entamoeba coli	**<dl**		<5.00e6
Pentatrichomonas hominis	**<dl**		<1.00e2
Worms	Result		Normal
Ancylostoma duodenale	**Not Detected**		Not Detected
Ascaris lumbricoides	**Not Detected**		Not Detected
Necator americanus	**Not Detected**		Not Detected
Trichuris trichiura	**Not Detected**		Not Detected
Taenia spp.	**Not Detected**		Not Detected

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	3.3	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	21	< 80	
Barium	(Ba)	1.7	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	0.3	< 4	
Cadmium	(Cd)	< dl	< 1	
Cesium	(Cs)	4.5	< 10	
Gadolinium	(Gd)	< dl	< 0.8	
Lead	(Pb)	0.3	< 2	
Mercury	(Hg)	1.3	< 4	
Nickel	(Ni)	1.6	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.3	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	0.2	< 5	
Tungsten	(W)	0.2	< 0.4	
Uranium	(U)	< dl	< 0.04	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	65.2	30- 225	

PRE-PROVOCATION

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	< dl	< 25	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	53	< 75	
Barium	(Ba)	0.4	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 2	
Cadmium	(Cd)	0.2	< 0.8	
Cesium	(Cs)	19	< 9	
Gadolinium	(Gd)	< dl	< 0.5	
Lead	(Pb)	2.6	< 2	
Mercury	(Hg)	37	< 3	
Nickel	(Ni)	4.9	< 8	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.6	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	0.2	< 4	
Tungsten	(W)	< dl	< 0.4	
Uranium	(U)	< dl	< 0.03	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	61.1	35- 240	

POST-PROVOCATION

Treatment Considerations

Parasites and Heavy Metals… which to treat first?

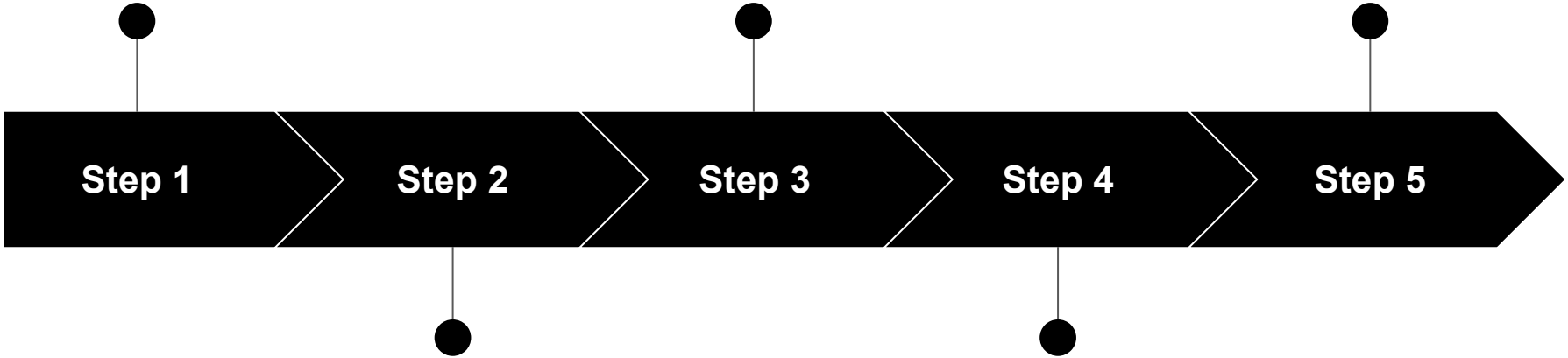
- Parasites can house heavy metals, making them very difficult to get bind and excrete
- After chelation failed to move the needle enough initially. Switched treatment to parasites, then chelation removed the metals.

ALWAYS treat parasites and chronic infections prior to heavy metal chelation to increase efficacy.

Avoid exposure (stop sushi consumption)

After parasite cleanse patient **removed the last 4 amalgams with biological dentist** and did sauna and colonics with Vitamin C drip and glutathione post removal

Pt felt ill after first two treatments, added in supportive chelation protocol to minimize side effects

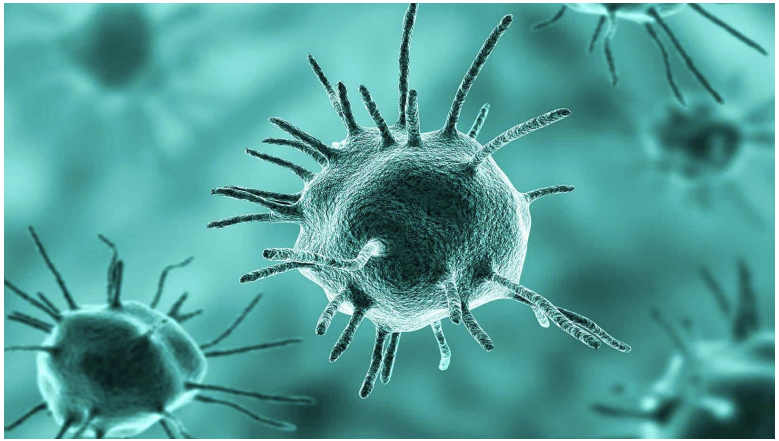


First treat parasites to support gut health and integrity- gut issues resolved after 3 months

Started IV chelation therapy (10 rounds weekly) EDTA/DMPS followed by glutathione push

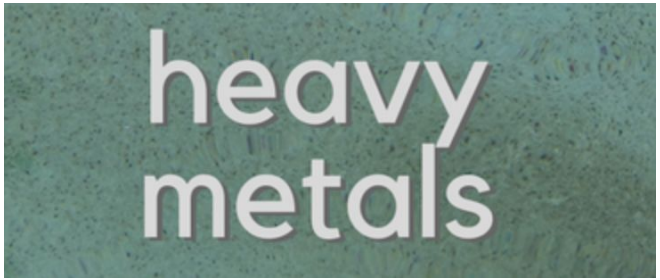
Treatment - Parasites

- **Herbal Antimicrobials**
- **Herbal Antiparasitics**- Black Walnut, Garlic, Oil of Oregano
- **Probiotics-** 100 billion count daily
- **Colonics-** once a month- 3 sessions
- **GI Binders**- activated charcoal, zeolite, humic/fulvic Acid, apple pectin
- No Sushi consumption
- **Treatment for 3 months**
- **Gas, Bloating and Loose Stools resolved after 3 months**



Treatment- Metals

- **Infrared Sauna** - 4 times a week- 30-45 minutes - 135-150 degrees- followed by a cold shower
- **Charcoal/Binders**
- **Chlorella**
- **Bentonite Clay**
- **Minerals Repletion**
- **IV chelation (with DMPS)**- 10 treatments- of EDTA followed by DMPS followed by Glutathione Infusion
- **Herbal Liver Detox Support**
- **Chelation Support Formula**
- **Daily Fiber Supplement**
- **Liposomal Glutathione**
- **Probiotics**



Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	10	< 35	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	9.5	< 80	
Barium	(Ba)	1.5	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	8.2	< 4	
Cadmium	(Cd)	0.3	< 1	
Cesium	(Cs)	5.8	< 10	
Gadolinium	(Gd)	0.2	< 0.8	
Lead	(Pb)	0.5	< 2	
Mercury	(Hg)	0.7	< 4	
Nickel	(Ni)	4.1	< 10	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.3	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	0.4	< 5	
Tungsten	(W)	< dl	< 0.4	
Uranium	(U)	< dl	< 0.04	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	23.7	30- 225	

PRE-PROVOCATION

Toxic Metals; Urine

TOXIC METALS		RESULT µg/g creat	REFERENCE INTERVAL	WITHIN REFERENCE / OUTSIDE REFERENCE
Aluminum	(Al)	< dl	< 25	
Antimony	(Sb)	< dl	< 0.2	
Arsenic	(As)	54	< 75	
Barium	(Ba)	2.3	< 7	
Beryllium	(Be)	< dl	< 1	
Bismuth	(Bi)	< dl	< 2	
Cadmium	(Cd)	< dl	< 0.8	
Cesium	(Cs)	11	< 9	
Gadolinium	(Gd)	< dl	< 0.5	
Lead	(Pb)	1.4	< 2	
Mercury	(Hg)	4.5	< 3	
Nickel	(Ni)	3.7	< 8	
Palladium	(Pd)	< dl	< 0.3	
Platinum	(Pt)	< dl	< 0.1	
Tellurium	(Te)	< dl	< 0.5	
Thallium	(Tl)	0.4	< 0.5	
Thorium	(Th)	< dl	< 0.03	
Tin	(Sn)	< dl	< 4	
Tungsten	(W)	< dl	< 0.4	
Uranium	(U)	< dl	< 0.03	

URINE CREATININE	RESULT mg/dL	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	12.0	35- 240	

POST-PROVOCATION

Patient Response to Treatment

Nine Months Post Initial Visit

1. Patient's Brain Fog decreased by 70%
2. Energy improved by 80%
3. No longer experiencing sinus infections
4. Gut back to normal
5. No dizziness episodes
6. Liver enzymes and triglycerides improved after removing parasites (ALT = 40 AST = 23 TG = 109)

Clean Living: Resources

Water Filters

- Tap water is one of the main sources for heavy metal exposure in the US
- Quality water filters can remove heavy metals from the supply
- Use Reverse Osmosis Filters
  - KDF Filters
- Whole House Filtration System
- Mountain Valley Spring Water-
  - Water Delivery

Air Purifiers

- Air exposure is another common heavy metal exposure
  - Living next to highways, factories, farms
  - Recently bought new furniture and off-gassed indoors
  - Recently painted
  - Dust
- Air Purifiers
  - IQ Air- Home and Car Filtration
  - Austin Air
  - Air Doctor

Sauna

- In-home sauna can be a great tool to detoxify the cells and organs, promoting sweating out the metals
- ClearLight InfraRed Sauna
- Sunlighten InfraRed Sauna
- Portable IR Sauna
- Higher Dose Infrared PEMF Mat
- Ensure all saunas are low EMF

Skin Brushing (Dry)

- Lymph fluid is responsible for moving and removing toxins throughout the body. If lymph fluid gets stuck, so do the toxins.
- Dry Skin Brushing promotes lymph movement. Always brush lymph towards the heart.
- Brush before every shower
- Brush before doing sauna

Website Resources

- List of Consumer Products that Contain Mercury
  - https://www.epa.gov/mercury/mercury-consumer-products#list
- Clean Label Project
  - https://cleanlabelproject.org
- Environmental Working Group
  - https://www.ewg.org/consumer-guides
- National Association of Environmental Medicine
  - https://envmedicine.com/learning-center/public-resources/
- Clean Water Action
  - https://www.cleanwateraction.org
- Campaign for Safe Cosmetics
  - https://www.safecosmetics.org
- Sources of Arsenic Exposure
  - https://www.dartmouth.edu/~arsenicandyou/