



Heavy Metal Sources	Clinical Protocol
<ul style="list-style-type: none"><li>• <b>Aluminum</b> <b><u>Physiological Effects</u></b><ul style="list-style-type: none"><li>- Decreases production by interfering with phosphorylation</li><li>- Decreases absorption of Iron, Mg and phosphate</li><li>- Increases PHT (due to poor PO<sub>4</sub> abs.)</li><li>- Increases impairs heme synthesis... low Hgb</li><li>- May cause hyperammonemia</li></ul></li> <li>• <b>Aluminum</b> <b><u>Sources</u></b><p>Antacids, aluminum hydroxide, over the counter drugs, douches, aluminum cookware, aluminum flatware, aluminum coffee pots, aluminum foil, some types of cosmetics, antiperspirants, baking powders, contaminated water, food additives, some colloidal minerals and some herbs or herbal products. Aluminum is used in the hydrogenation process for margarine, (fatty acids are a transport system for crossing the blood/brain barrier.)</p></li> <li>• <b>Antimony</b> <b><u>Physiological Effects</u></b><ul style="list-style-type: none"><li>- Accumulates in the adrenals, thyroid, kidney, liver spleen and bone</li><li>- Inhibits monoamine oxidase activity in the brain and liver</li><li>- Associated with ADD/ADHD (so studies)</li><li>- Adequate magnesium and selenium help reduced the uptake</li></ul></li> <li>• <b>Antimony</b> <b><u>Sources</u></b><p>Food, smoking gun powder, textile industry, metal alloys, antihelminthic &amp; antiprotozoic drugs, manufactured in paints, glass, ceramic, solder, metal work, batteries, printing, rubber processing, mining and smelting, flame retardants in textiles, tobacco bearing metals, and semi conductors</p></li> <li>• <b>Arsenic</b> <b><u>Physiological Effects</u></b><ul style="list-style-type: none"><li>- Organic and inorganic forms (eg from water) are both easily absorbed</li><li>- Deposits in the kidneys, liver, spleen and skin</li><li>- Disables alpha lipoic acid (an important antioxidant)</li><li>- Potential carcinogen</li></ul></li> <li>• <b>Arsenic</b> <b><u>Sources</u></b><p>Soil, wood preservatives, seafood (oysters, mussels, fish), drinking water (as widely distributed in the earth's crust @ 5ppm), pesticides, chemical, electronic and photoelectric processes, fire oils and coal, weed killers, laundry aides, tobacco, pressure treated lumber, some commercially produced chicken</p></li></ul>	

- **Barium**  
**Sources**

Present in the earth's crust. Found after contrast studies (x-ray) of colon and lungs. Dental composites, ceramics and plastics, paper fillers, explosives, jet fuels, pesticides and insecticides. Well established as a neurotoxin.

- **Bismuth**  
**Sources**

Fusible alloys, electric fuses, low-melting solders, tempering bathes for steel, mirrors, dental, medications like pepto-bismol

- **Calcium**  
**Sources**

Used as deoxidizer for copper and steel, hardens lead for bearings, flints for cigarette gas lighters

- **Cadmium**  
**Physiological Effects**

- Competes with zinc
- Low calcium exacerbates problems
- Hypertension link
- C-V disease link
- Changes in the arterial endothelium can occur with Cd toxicity
- Decrease phase 1 cytochrome P-450 isoenzymes
- May modify catecholamine metabolism
- Associated with hypo/hypertension
- Decreases CYP -450 isoenzymes
- May affect catecholamine metabolism
- Inhibits antitrypsin
- Predominately accumulates in the kidneys (proximal tubules)
- Can affect arterial endothelium

- **Cadmium**  
**Sources**

Various food from fruits, oysters, shell fish and anchovies, coffee, tea, soft drinks, cigarette and pipe smoke-(cadmium is found in high amounts in tobacco) water pipes, coal burning facilities, fungicides and pesticides, plastics, permanent solutions, "dye", bleach, some hair sprays, organic grains, nearby traffic. Also seafood, liver and kidney meats, soft water.

Plants may only contain small or moderate amounts in non-industrial areas, but high levels may be found in the liver and kidneys of adult animals. The general population and people living near hazardous waste sites may be exposed to cadmium in contaminated food, dust, or water from unregulated releases or accidental releases. Some sources of phosphate in fertilizers contain Cadmium in amounts of up to 100 mg/kg, which can lead to an increase in the concentration of Cadmium in soil. Cadmium occurs naturally in the environment from the gradual process of erosion and abrasion of rocks and soils, and from singular events such as forest fires and volcanic eruptions. It is therefore naturally present everywhere in air, water, soils and foodstuffs. Because of this wide variety of unique properties, cadmium metal and cadmium compounds are used as pigments, stabilizers, coatings, specialty alloys, electronic compounds, but, most of all (more than 80% of its use), in rechargeable nickel-cadmium batteries

## **Clinical Conditions**

Acute exposure to cadmium fumes may cause flu like symptoms including chills, fever, and muscle ache sometimes referred to as "the cadmium blues." Symptoms may resolve after a week if there is no respiratory damage. More severe exposures can cause tracheo-bronchitis, pneumonitis, and pulmonary edema. Symptoms of inflammation may start hours after the exposure and include cough, dryness and irritation of the nose and throat, headache, dizziness, weakness, fever, chills, and chest pain.

Inhaling cadmium-laden dust quickly leads to [respiratory tract](#) and [kidney](#) problems which can be fatal (often from [renal failure](#)). Ingestion of any significant amount of cadmium causes immediate poisoning and damage to the [liver](#) and the kidneys. Compounds containing cadmium are also [carcinogenic](#).

The bones become soft ([osteomalacia](#)), lose bone mineral density ([osteoporosis](#)) and become weaker. This causes the pain in the joints and the back, and also increases the risk of fractures. In extreme cases of cadmium poisoning, mere body weight causes a fracture.

The kidneys lose their function to remove acids from the blood in *proximal renal tubular dysfunction*. The kidney damage inflicted by cadmium poisoning is irreversible and does not heal over time. The *proximal renal tubular dysfunction* creates low phosphate levels in the blood ([hypophosphatemia](#)), causing muscle weakness and sometimes coma. The dysfunction also causes [gout](#), a form of [arthritis](#) due to the accumulation of uric acid crystals in the joints because of high [acidity](#) of the blood ([hyperuricemia](#)). Another side effect is increased levels of [chloride](#) in the blood ([hyperchloremia](#)). The kidneys can also shrink up to 30%.

Other patients lose their sense of smell ([anosmia](#)).

- **Chromium**

- **Sources**

- Chrome plating steel, stainless steel, nickel

- **Copper**

- **Sources**

- Drinking water (copper pipes), cook wear, oral contraceptives, copper containing supplements, most natural foods (whole grains, shell fish, liver, beans and nuts)

- **Gold**

- **Sources**

- Jewelry, dental, currency, medicines

- **Lead**

- **Physiological Effects**

- Low Zn, Ca, Mg
- Worse with Cd
- Parasthesias
- Learning problems
- Pb exerts major negative effects in the CNS
- Essential to assess early as damage is progressive and pervasive through childhood and young adulthood
- Deposits in the bone, aorta, kidney tubules, brain, adrenals, thyroid and liver
- Binds to Hb, inhibits heme synthesis
- Depresses mitochondrial respiratory chain (involved in energy metabolism)

- **Lead**  
**Sources**  
Leaded gasoline, batteries, industrial smelting and alloying, some types of solders, paint, stained glass, dolomite, soil, newsprint, batteries, foods, drinking water, pottery, cans, cosmetics, hair coloring, cigarettes, pesticides, eating lead-contaminated liver, air pollution, bullets, fishing sinkers, pewter ware, leaded joints in some water systems
- **Magnesium**  
**Sources**  
Precision instruments, optical mirrors, dry batteries, flash bulbs, flares, glazes & pigments, gasoline additive MMT, some water systems
- **Mercury**  
**Physiological Effects**
  - May be an etiological factor in depression, excessive anger, and anxiety because mercury can produce such symptoms perhaps by affecting the neurotransmitters in the brain.
  - Psychometric evidence that mercury from silver dental fillings may be an etiological factor in depression, excessive anger, and anxiety
- **Mercury**  
**Sources**  
Dental amalgams, large fish, shellfish, water supplies, some hemorrhoid preparations, laxatives, inks used in some printing and tattoos, skin lightening agents, cosmetics, instruments (thermometers, electrodes, batteries), combustion of fossil fuels, some fertilizers, fungicides and pesticides, some types of paint, paper/pulp, coal burning emissions, mining, explosives, gold industries, electrical relays.
- **Molybdenum**  
**Sources**  
Mfg. steel for tools, rifle barrels, propeller shafts, sparkplugs, glass-to metal seals, lubricant additive
- **Nickel**  
**Sources**  
Food, catalyst materials (for hydrogenation processes in the food, petroleum and petrochemical industries) dental metals, jewelry, inhaled nickel carbonyl (a carcinogenic gas that results from the reaction of nickel with heated carbon monoxide from cigarette smoke, car exhaust and some industrial waste), metal cooking utensils, hydrogenated fats, fertilizers, nickel-cadmium batteries, electroplating, plated objects, nickel-containing prostheses, pigments (usually for ceramics or glass), arc welding, nickel refining and metallurgical processes,
- **Osmium**  
**Sources**  
Fine machine bearings, ammonia, hydrogenation of organic compounds
- **Palladium**  
**Sources**  
Gold, silver and copper alloys in dentistry, alloy bearings, springs, wheels of watches, mirrors, as catalyst in mfg. of sulfuric acid and other oxidizing processes
- **Platinum Sources**  
Laboratory and industrial use, thermocouples, thermometers, acid proof containers, dentistry, jewelry, electro plating oxidation catalyst in mfg., acetic acid, nitric acid from ammonia, mfg. sulfuric acid

- **Radium**  
Sources  
Radiology, old luminous paints
- **Selenium**  
Sources  
Toning baths and photography, pigment in mfg. ruby, pink, orange or red glass, electrodes for arc lights, electrical instruments, rectifier in radio and television sets, processing of rubber, dehydrogenation of organic compounds
- **Silver**  
Sources  
Coins, table wear, mirrors, jewelry, ornaments, electroplating processing foods and beverages, hydrogenation and oxidation processes, dental alloys, purification of drinking water
- **Tellurium**  
Sources  
Coloring agent in china wear, porcelains, enamels, glass; producing black finish on silver wear, mfg. special alloys of marked electrical resistance.
- **Tin**  
Sources  
Tin-plating stainless steel, soldering alloys, mfg. tin salts, collapsible tubes, dental amalgams, food containers, breath mint containers.
- **Titanium**  
Sources  
Used as an alloy for strengthening: copper, bronze, steel, cooking utensil, dental implants and some crowns, enamels, bridge and orthodontic materials, some artificial joints, some surgical screws and plates. Found in paints, lacquers, inks (white pigment) pharmaceuticals (antibiotics, antidepressants drugs) toothpastes, sunscreens, cosmetics, ointments and lotions, white cheese (mozzarella), food additives, pesticides. Can result primarily in lung symptoms, bronchitis, and fibrosis and is considered a carcinogen by some. Also results in contact dermatitis and allergy symptoms. If titanium is in the body, it will cause corrosion of the less precious (inert) metal. Mercury will corrode faster than titanium if in the same body and titanium will corrode faster if in the presence of gold
- **Uranium**  
Sources  
Ground (drinking) water, root vegetable, high phosphate fertilizers, ceramics, some colored glass, many household products (uranium acetate), mines
- **Zinc**  
Sources  
Galvanizing sheet iron, ingredient of alloys: bronze, brass, babbitt metal, German silver and special alloys for dye casting; protective coating for electrical apparatus, dry cell batteries, household utensils, castings, spring plates, building materials, railroad car linings, automotive equipment reducing agent in organic chemistry for deoxidizing bronze, extracting gold by cyanide process, purifying fats for soaps.

References: Lee Cowden  
Doctors Data  
Louisa Williams- Radical Medicine  
A4M – Patrick Hanaway