

Listed below are common sources of exposure, both occupational and in every day life of the most common and most toxic of the heavy metals. While some of these sources are historical, it is important to remember that heavy metals often accumulate in bone, brain, connective tissue, muscle (including heart muscle), fat, kidneys, and other tissues. They are not efficiently excreted by the body. Therefore, even exposures from the distant past may be relevant as well as small daily doses over years of exposure. The list of signs and symptoms is not intended to be exclusive and toxicity may cause only one or a few of the symptoms listed. If you have any of these symptoms or possible exposures, please discuss with the doctor how to test for, treat, and eliminate these sources.

ALUMINUM

The toxicity of aluminum has long been a disputed subject. Although many scientists did not previously consider aluminum to pose a significant health risk, recent evidence seriously questions this conclusion. Research now suggests that aluminum may interfere with normal body functioning at levels lower than previously assumed and there have been increasing reports of aluminum toxicity from environmental exposure.

SOURCES

- Antacids (certain brands: check labels)
- Aluminum cooking vessels
- Baking powder (contains aluminum sulfate)
- Deodorants and antiperspirants
- Aluminum dust from industrial aluminum manufacturing
- Building construction materials
- Household and industrial utensils
- Insulated cables and wiring
- Packaging materials (e.g. cooking with or wrapping food in aluminum foil)
- Fine aluminum powder used in bronze paint
- Aluminum cans
- Drinking water (alum used to kill bacteria)
- Soil (naturally occurring ores)
- Coal burning power plants
- Plants, including those used as food
- Beer
- Milk and milk products (from equipment)
- Alum used in food processing, such as pickles and maraschino cherries
- Medicinal aluminum compounds used externally to treat dermatitis, wounds, and burns
- Nasal spray (alum)
- Toothpaste
- Ceramics (made from Al₂O₃ clay)
- Dental amalgams
- Cigarette filters and Tobacco smoke
- Automotive exhausts
- Pesticides
- Animal feed
- F D & C color additives
- Vanilla powder
- Table salt and seasonings
- Bleached flour
- American cheese
- Fumigant residues in foods (aluminum phosphide)
- Kaopectate and other medications containing Kaolin (aluminum silicate)
- Feldspar and mica
- McIntyre aluminum powder (used in prophylaxis of silicosis)
- Aluminum silicate paste (arthritis treatment)
- Sutures with wound-healing coatings containing aluminum
- Aluminum chelates of polysaccharide
- sulfuric acid esters for peptic ulcer treatment
- Aluminum nicotinate (hypercholesterolemia treatment)

OCCUPATIONAL EXPOSURES

- Manufacturing of aluminum abrasives
- Treating bauxite ore to obtain alumina
- Production of aluminum sulfate (alum) from bauxite ore
- Manufacturing of aluminum products

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- Aluminum alloy manufacturing
- Paper industry
- Glass industry
- Textile industry (waterproofing)
- Use of aluminum abrasives in many industrial operations

- Manufacturing of aluminum metal powders
- Synthetic leather manufacturing
- Aluminum welding
- Porcelain industry
- Explosives manufacturing
- Pyrotechnical devices manufacturing and use

SIGNS AND SYMPTOMS

- Aluminum pneumoconiosis (inhalation of Al dust) and pneumothorax
- pulmonary fibrosis with emphysema
- dyspnea
- right-sided cardiac hypertrophy
- Shaver's disease: cough, substernal pain, weakness, fatigue, bilateral lacelike shadowing on lung x-ray
- Phosphate binding in GI tract
- aching muscles
- rickets
- osteoporosis

- Skin reactions (from Al antiperspirants)
- miliaria (acute inflammation of sweat glands)
- Encephalopathy
- Senile dementia (Alzheimer's Disease)
- Nephritis
- Hepatic dysfunction
- Gastric distress
- GI inflammation, colitis
- flatulence and acid eructation (belching)
- Hyperactivity in children
- Psychosis in children

ARSENIC

Arsenic is a common environmental contaminant derived from natural and anthropogenic sources. Both oral ingestion and inhalation of arsenic are modes of intoxication. Arsenical toxicity is highly dependent on the chemical form, oxidation state, and route of exposure. Natural concentrations of arsenic in foodstuffs are usually rapidly absorbed but also quickly excreted. Absorbed arsenic is transported by the blood to the kidneys, liver, spleen, skin, hair, and nails in that order. Some arsenic may remain in tissues long after it has disappeared from the blood, urine and feces.

SOURCES

- Rat poisons
- Insecticide residues on fruits and vegetables (eg. Apple orchards)
- Herbicide residues on cottonseed products
- Wine (if arsenical insecticides used in vineyards)
- Drinking water
- Well water
- Seafood
- Some kelp supplements
- Seawater
- Feed additives (poultry and livestock)

- Coal burning
- Air polluted by arsenic dust from industrial plants
- Wood preservatives
- Wallpaper dye and plaster (containing volatile arsenicals)
- Paris green (arsenic containing pigment formerly used in ornaments, toys, curtains, carpets)
- Some household detergents
- Colored chalk
- Automobile exhaust

OCCUPATIONAL EXPOSURES

- Smelter workers
- Chemical workers handling inorganic arsenic

- Vintners working with arsenical insecticides
- Sheep dip workers using sodium arsenite
- Gold miners (associated arsenic ores)

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- Processors of taconite (low grade iron ore)
- Acetylene workers
- Alloy makers
- Aniline color workers
- Bleaching powder makers
- Boiler operators
- Book binders
- Bronze makers
- Colored candle makers
- Cannery workers
- Ceramic enamel workers
- Painters
- Paper hangers
- Petroleum refinery workers
- Plumbers
- Solderers
- Tree sprayers
- Wood preservative makers
- Hide preservers
- Taxidermists
- Weed sprayers
- Forestry workers

SIGNS AND SYMPTOMS

- Headache
- Drowsiness, fatigue, chronic fatigue syndrome
- Confusion
- Brittle nails
- Follicular dermatitis
- Hoarse voice

CADMIUM

Cadmium is toxic to every body system whether ingested, injected, or inhaled and tends to accumulate in body tissues. Consequently there is concern about the increase in environmental cadmium that has occurred as a result of its increasing industrial use. Inhaled cadmium is usually better absorbed than ingested cadmium. Once absorbed, the elimination rate is generally very slow. The toxicity of cadmium, however, is significantly influenced by dietary intake of other elements such as zinc, copper, and selenium.

SOURCES

- Drinking water
- Soft water, causing uptake of Cadmium from galvanized pipes
- Soft drinks from vending machines with Cadmium piping
- Refined wheat flour (increased Cadmium: Zinc ratio)
- Batteries (nickel-cadmium)
- Evaporated milk
- Many processed foods
- Oysters, kidney, liver
- Rice (irrigated by Cadmium - contaminated water)
- Cigarette smoke and Tobacco
- Super-phosphate fertilizers
- Cadmium alloys (e.g. dental prosthetics)
- Ceramics
- Paint pigments (yellow tint)
- Electroplating
- Cadmium vapor lamps
- Tools rust-proofed with cadmium
- Marine hardware rust-proofed with cadmium
- Welding metal, Solders, bolts
- Silver polish
- Polyvinyl plastics
- Soil: Fungicides and Pesticides
- Sewage sludge and effluents
- Copper refineries
- Dust in urban streets, homes, businesses, and schools
- Rubber carpet backing
- Black rubber: rubber tires
- Burning of motor oil
- Plastic tapes
- Black polyethylene

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OCCUPATIONAL EXPOSURES

- Nickel-cadmium battery manufacturing
- Zinc or polymetallic ore smelting
- Paint manufacture using cadmium pigments
- Painting with cadmium pigments
- Jewelry making
- Cadmium alloy manufacturing
- Ceramic making using cadmium
- Electroplating metals with cadmium and Process engraving
- Cadmium vapor lamp manufacturing
- Rustproofing tools, marine hardware, etc.
- Tool & die workers, Soldering
- Tetraethyl lead manufacturing (uses diethyl cadmium)
- Fungicide manufacturing

SIGNS AND SYMPTOMS

- Fatigue, chronic fatigue syndrome
- Hypertension (possibly related to increased concentration of Cadmium in renal parenchyma)
- Iron deficiency anemia
- Emphysema
- osteomalacia in parous women over 40 years of age with dietary deficiencies
- liver damage
- Anosmia (loss of sense of smell)
- Yellow coloring of teeth
- Reduced birth weight in newborns
- Renal colic (with passage of calculi)
- Nephrocalcinosis
- Hypercalcuria
- Pain in lower back and legs
- Pain in sternum
- "Milkman's syndrome" (lines of pseudofracture in scapula, femur, ileum)
- Hypophosphatemia
- Possible rheumatoid arthritis
- Decreased production of active Vitamin D
- Decreased pulmonary function
- Proteinuria, glucosuria, and aminoaciduria
- Possible prostatic cancer (in workers exposed to Cadmium oxide)
- Possible carcinogenesis
- Increased mortality

COPPER

Although copper is an essential element, there are situations in which the possibility of human copper toxicity requires consideration. Wilson's Disease (an in-born error of human metabolism) represents a special case of copper toxicosis. Large amounts of copper accumulate in the liver, kidney, and brain of those with this disease. Copper can be absorbed by the lungs, skin, uterus, and gastrointestinal tract. The toxic effects of copper are related to the adequacy of other elements, such as zinc. Soil copper is high in certain Northeastern states, such as Connecticut.

SOURCES

- Drinking water
- Copper plumbing and piping Surface and ground water
- Animal and industrial waste Fungicides and insecticides Sewage sludge
- Oysters, liver, nuts, and chocolate
- Vinegar, carbonated beverages, or citrus juices if prolonged contact with copper
- Beer (from copper piping and brew kettles) Refrigerator ice makers
- Hemodialysis
- Copper intrauterine contraceptive devices (IUD)
- Copper in dental prosthesis
- Milk (accumulates copper from heated copper rollers during pasteurization)
- Industrial emissions

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- Swimming pools (fungicide)
- Copper cookware
- Vitamin-mineral supplements

OCCUPATIONAL EXPOSURES

Jewelry manufacturing
Riveting of heavy copper bus parts
Metal fumes
Copper smelter and refinery workers
Vineyard workers (copper sulfate used to prevent mildew)
Copper miners
Copper piping manufacturing
Plumbers
Copper utensil manufacturing

SIGNS AND SYMPTOMS

Accidental poisoning (acute):

- vomiting
- hematuria
- diarrhea
- oliguria
- jaundice
- hypotension
- impaired liver function
- coma
- hemoglobinuria
- death

Copper metal fume fever:

- chills
- dryness of mouth and throat
- fever
- Arthritis
- Scleroderma
- Eczema
- Schizophrenia
- Post partum psychosis
- Autism
- Fatigue
- Graying hair
- headache
- aching muscles
- digestive disorders
- Menstrual irregularities
- Gingivitis (caused by Copper containing dental work)
- Nasal irritation
- Bitter taste
- Anemia (iron-deficiency)
- Atherosclerosis

LEAD

Lead has long been known as a toxic element. At one time it was felt that the only significant sources that increased lead ingestion were due to plaster, paint, or industrial exposure. Although this is probably true for acute lead poisoning, it is not true for chronic lead toxicity. The increasing prevalence of lead as an environmental contaminant has led to sub-clinical exposures which often result in subtle, yet significant, adverse health effects. Although lead gasoline additives were banned in the early 1970's which eliminated a degree of environmental exposure, statistics showed that the average urban adult continued to inhale 20-40 ug. of inorganic lead per day even into the late 1980's. Lead may enter the body through ingestion, inhalation, or skin eruption. Adults normally absorb 5.10% of ingested lead while children may readily absorb up to 50%. Inhaled lead is absorbed at 25 - 100% depending on the lead particle size. Tolerance to lead varies with age forms, and sources of lead, and the composition of the diet being consumed.

SOURCES

- Atmospheric lead
- motor vehicle exhausts (persists in soil)
- lead smelters
- coal burning
- refining lead scrap
- burning materials containing lead
- Dust and dirt
- Leaded house paint (still present in older homes)
- Sanding, sandblasting or chipping paint
- Drinking water
- Lead plumbing
- Vegetation grown on lead contaminated soils, eg. by roadside
- Canned fruit and fruit juice
- Canned evaporated milk
- Milk from animals grazing on contaminated pastures
- Bone meal
- Organ meats, especially liver
- Lead-arsenate pesticides
- Wine (leaded caps)
- Rainwater / Snow
- Improperly glazed pottery Painted glassware Pencils (paint)
- Toothpaste
- Newsprint
- Colored printed materials
- Eating utensils
- Curtain weights
- Putty
- Car batteries
- Cigarette smoke, ash, Tobacco
- Lead shot / bullets
- Mascara
- Painted children's toys
- PVC containers
- Canned pet food
- Hair dyes (progressive darkeners)

OCCUPATIONAL EXPOSURES

- Galvanizers
- Battery makers
- Garage mechanic
- Blacksmiths
- Glass makers/ polishers
- Bookbinders
- Bottle cap makers
- Glost kiln workers
- Brass founders
- Gold refiners
- Flower makers (artificial)
- Actors
- Acid finishers
- Brass polishers
- Gun barrel browners
- Braziers
- Incandescent lamp makers
- Brick burners
- Ink makers
- Brick makers
- Insecticide makers / users
- Bronzers
- Brushmakers
- Cable makers
- Cable splicers
- Jewelers
- Canners
- Junk metal refiners
- Cartridge makers
- Labelers (paint can)
- Chemical equipment makers
- Lacquer makers
- Chlorinated Paraffin makers
- Lead burners
- Chippers
- Lead counterweight makers
- Cigar makers
- Lead flooring makers
- Crop dusters
- Lead foil makers
- Cutlery makers
- Lead mill workers
- Foundry workers
- Decorators (pottery)
- Lead miners
- Demolition workers
- Lead pipe makers
- Dental technicians
- Lead salt makers
- Diamond polishers
- Lead shield makers
- Dye makers
- Lead smelters
- Dyers
- Lead stearate makers
- Electronic circuit or device makers
- Lead workers
- Electroplaters
- Linoleum makers
- Electrotypers
- Linotypers

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- Embroidery workers
- Linseed oil boilers
- Emery wheel makers
- Lithotransfer workers
- Enamel burners
- Enamellers / Enamel makers
- Match makers
- Explosives makers
- Metal grinders / cutters / polishers
- Metal refiners /burners
- Farmers
- Metal File cutters
- Firemen
- Metal refinishers /Metallizers
- Semiconductor workers
- Mirror silverers
- Service station attendants
- Musical instrument makers
- Sheet metal workers
- Nitric acid workers
- Shellac makers
- Nitroglycerin makers
- Ship dismantlers
- Painters
- Shoe stainers
- Paint makers
- Shot makers
- Paint pigment makers
- Silk weighters
- Paper hangers
- Slushers (porcelain enameling)
- Patent leather makers
- Solderers / Solder makers
- Pearl makers (imitation)
- Pharmaceutical makers
- Steel engravers
- Photography workers
- Pipe fitters
- Tannery workers
- Plastic workers
- Television picture tube makers
- Plumbers
- Printers
- Textile makers
- Policemen
- Tile makers
- Pottery glaze mixers
- Tanners
- Pottery glaze dippers
- Type founders / setters
- Pottery workers
- Putty makers
- Vanadium compound makers
- Pyroxylin-plastic workers
- Varnish makers
- Riveters
- Toll booth attendants
- Roofers
- Wallpaper printers
- Rubber buffers
- Welders
- Rubber mill workers / reclaimers
- Wood stainers
- Scrap metal workers
- Zinc smelter chargers

COMMON NONOCCUPATIONAL LEAD EXPOSURES INCLUDE:

- Ceramics, pottery and related hobbies
- Ceramics from other countries
- Stained glass work
- Electronics /related hobbies involving soldering
- Firing ranges
- Hunting (especially those who cast their own bullets)
- Eating or drinking from improperly fired lead-glazed ceramic tableware
- Eating lead-bearing paint
- Burning battery casings
- Consuming illicitly distilled whiskey
- Extensive work with motor fuels
- Painting with lead-containing paints
- Home plumbing repairs (lead pipe systems)
- Exterminating
- Extensive auto driving (especially in cities)

SIGNS AND SYMPTOMS

- Headache
- Depression
- Insomnia and/or drowsiness
- Fatigue, chronic fatigue syndrome
- Nervousness, Anxiety
- Irritability
- Dizziness
- Confusion / disorientation
- Neurological deficits

- Muscle weakness and wasting
- Saturnine gout
- Aching muscles and bones
- Abdominal pain
- Loss of appetite
- Loss of weight
- Constipation
- Hypertension
- Kidney function defects
- Reproductive defects:
 - decreased fertility in men
 - spontaneous abortion in women
- Adrenal gland function impairment
- Iron deficiency anemia
- Blue-black lead lines near base of teeth

SYMPTOMS MORE COMMON IN CHILDREN:

- Hyperactivity (ADD/ADHD)
- Temper tantrums
- Withdrawal
- Frequent crying for no apparent reason
- Fearfulness
- Refusal to play
- Other emotional or behavioral problems
- Drowsiness / fatigue
- Learning disabilities
- Speech disturbances
- Perceptual motor dysfunctions
- Mental retardation
- Seizures or convulsions
- Ataxia
- Encephalopathy

MERCURY

Mercury, long known as a toxic element, has evoked increasing concern in recent years due to its use in industry and agriculture and the burning of fossil fuels. Methylmercury compounds and elemental mercury vapor are the two forms most likely to be involved in human exposures. In addition, the conversion of elemental mercury and mercury compounds by bacteria (in the intestinal tract) to the more toxic methylmercury also poses potential threats to human health. Ingested methylmercury is readily absorbed through the gastrointestinal tract and inhaled mercury vapor is easily retained by the pulmonary system. Skin absorption of mercury also occurs from touching or playing with elemental mercury.

SOURCES

- Mercury-silver amalgam (dental fillings)
- Consumption of grain seeds treated with methylmercury fungicides (esp. wheat)
- Fish, shellfish, and marine mammals
- Kelp and other seaweeds
- Medical sources:
 - Thimerosal (preservative in injectable pharmaceuticals)
 - Vaccinations / immunizations
 - Mercuric chloride (used in histology labs)
- Many common over the counter health medications including:
 - Antiseptics/first aid preparations

- Psoriasis medications
- Fungicides
- Calomel (body powders and talc)
- laxatives (containing calomel)
- Acne preparations
- Skin lightening /Bleaching creams
- Ear preparations
- Nasal sprays (Afrin, Neo-Synephrine, and others)
- Throat lozenges
- Hemorrhoid Ointments, suppositories (Lanacaine, Preparation H, and others)
- Hair tonic
- Mercurochrome and thimerosal (Merthiolate)
- Veterinary preparations (BagBalm and others)
- Mercury containing cosmetics/ mascara (especially waterproof)
- Contact lens solutions and other eye drops such as Murine, Allerest, and others
- Organic mercurials (historical use as diuretics)
- Broken thermometers and barometers
- Playing with elemental mercury
- Latex and solvent-thinned paints: mercury used as a fungicide (discontinued in 1992)
- Anti-fouling paint for boats
- Wood preservatives (ethyl mercury chloride)
- Sanding, sandblasting or chipping paint
- Air polluted by industrial mercury vapor
- Mercury polluted industrial water
- Clothing worn by mercury workers
- Fabric softeners
- Floor waxes and polishes
- Air conditioner filters
- Wood preservatives
- Cinnabar (used in jewelry)
- Cinnabar, yellow, vermilion pigments
- Batteries with mercury cells
- Gardening Chemicals:
 - Fungicides for use on lawns, trees, shrubs
 - Herbicides
 - Insecticides
- Tanning leather
- Felt
- Adhesives
- Photoengraving
- Photographic solutions
- Tattooing
- lab and industrial equipment using metallic mercury
- Sewage sludge used as fertilizer contaminates soil
- Sewage disposal (may release 1000's of tons of Hg annually world wide)

OCCUPATIONAL EXPOSURES

- Bactericide makers
- Battery makers, mercury
- Boiler makers
- Mirror makers
- Bronzers
- Neon light makers
- Paint makers
- Paper makers
- Carbon brush makers
- Percussion cap makers / loaders
- Caustic soda makers
- Pesticide workers
- Ceramic workers
- Photographers
- Chlorine makers
- Pressure gage makers
- Calibration instrument makers
- Dental amalgam makers
- Dentists
- Seed handlers
- Direct current meter workers
- Silver extractors
- Disinfectant makers
- Switch makers, mercury
- Disinfectors
- Tannery workers
- Drug makers
- Embalmers, Taxidermists
- Dye makers
- Textile printers
- Mercury workers, miners, refiners
- Electric apparatus makers
- Thermometer, Barometer, Manometer makers
- Electroplaters
- Vinyl chloride manufacturing
- Wood preservative workers
- Explosives makers
- Farmers
- Fingerprint detectors
- Fireworks makers
- Fish cannery workers
- Fungicide makers
- Fur preservers, processors
- Gold extractors
- Histology technicians
- Ink makers
- Insecticide makers
- Investment casting workers
- Jewelers
- Laboratory workers, chemical
- Lampmakers (fluorescent)

SIGNS AND SYMPTOMS

ELEMENTAL MERCURY EXPOSURE:

- Insomnia
- Drowsiness
- Shyness
- Depression
- Nervousness
- Loss of weight
- Dizziness
- Loss of appetite
- Memory Loss
- Neuropathy
- Tremors
- Lack of self-control
- Irritability
- Anxiety
- Hallucinations
- Loss of self-confidence
- Manic depression
- Fatigue, chronic fatigue syndrome
- Fibromyalgia

ORGANIC MERCURY EXPOSURE:

- fatigue
- headache
- forgetfulness
- numbness and tingling of the lips and feet
- Parasthesias/neuropathy
- muscle weakness progressing to paralysis
- loss of vision
- hearing difficulty
- speech disorders memory loss
- incoordination, ataxia
- emotional instability
- dermatitis
- renal damage

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- general brain dysfunction
- autism
- coma
- death

MERCURY CONTENT IN FISH: Data from www.nrdc.org

HIGH: Bluefish, Grouper, Mackerel (King, Spanish, Gulf), Marlin, Orange Roughy, Sea Bass (Chilean), Shark, Swordfish, Tilefish, Tuna (Ahi, Yellowfin, Big-eye, canned Albacore, except Oregon Choice Gourmet)

MEDIUM: Bass (striped, black), Carp, Cod, Croaker (White Pacific), Halibut (Pacific, Atlantic), Lobster, Mahi Mahi, Monkfish, Perch (freshwater), Sablefish, Skate, Snapper, Tuna (canned chunk light, Skipjack), Sea Trout

LOW: Anchovies, Calamari, Catfish, Clam, cod (Artic), Crab (domestic), Crawfish/Crayfish, Flounder, Haddock (Atlantic), Hake, Herring, Mackerel (N. Atlantic, Chub), Mullet, Oyster, Perch (ocean), Plaice, Pollock, Salmon* (wild Alaskan), Sardine, Scallop, Sole (Pacific), Tilapia, Trout (freshwater) Whitefish, Whiting

*Farmed Salmon may contain mercury and PCB's.

NICKEL

Nickel can be a toxic element in man. It can interact by four routes of entry into the body. These are oral ingestion, inhalation, parenteral administration, and percutaneous absorption. Nickel or nickel salts are relatively nontoxic when taken orally. Nickel toxicity from parenteral administration has only been observed experimentally. Cutaneous absorption may manifest as nickel dermatitis and is relatively common. The inhalation of nickel carbonyl causes the most serious type of nickel toxicity, although it usually occurs only in occupational workers due to an industrial accident.

SOURCES

- Tobacco smoke
- Contamination of air, drinking water, soil and vegetation by industrial nickel
- Testing of nuclear devices (radionuclide Ni-631)
- Exhausts of automobiles and trucks
- Burning of coal and oil for power generation
- Burning of fuel oil for space heating
- Wear of automobile tires and brake linings
- Superphosphate fertilizers
- Stainless steel cookware (Nickel absorbed by acid foods)
- Dissolved nickel from food-processing equipment
- Hydrogenated fats and oils
- Baking powder
- Dental fillings
- Nickel-cadmium batteries

SOURCES OF CONTACT FOR ALLERGIC INDIVIDUALS:

- Nickel jewelry
- Nickel coins
- Clothing fasteners
- Tools
- Cooking utensils
- Stainless steel kitchens
- Detergents
- Prostheses
- Medical appliances
- Metal chairs
- Thimbles
- Needles
- Scissors
- Zippers
- Bobby pins
- Fountain pens

OCCUPATIONAL EXPOSURES

- Nickel mining, refining
- Nickel electroplating
- Nickel alloy makers
- Nickel cadmium battery workers
- Chemical industry
- Manufacture of items listed above
- Electronics and computer industry
- Food processing
- Nickel waste disposal / recycling

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- Ceramics industry workers
- Duplicating machine workers
- Dyers
- Ink makers Jewelers
- Spark plug makers
- Rubber workers
- Plastics industry
- Coin manufacturers
- Automotive parts makers

SIGNS AND SYMPTOMS

- Nickel dermatitis ("nickel itch"): itching, burning, rash on fingers, wrist, forearms, earlobes, or other exposed area. The reaction is largely allergic in nature.
- Pulmonary cancer (from nickel in tobacco smoke)
- **Acute toxicity:**
 - Dyspnea
 - cyanosis
 - tachypnea
 - fatigue/apathy
 - headache
 - anorexia
 - insomnia
 - vomiting
 - fever
 - diarrhea

RESOURCES AND MORE INFORMATION:

Centers for Disease Control's Agency for Toxic Substances and Disease Registry (ATSDR) at www.atsdr.cdc.gov
www.hem.unep.ch
www.nlm.nih.gov/medlineplus/mercury.html
<http://www.emedicine.com/emerg/topic813.htm>

Regarding mercury containing (thimerosal) vaccines and autism:

<http://www.universityofhealth.net/PR/3304PRUSNOMHearing.htm> <http://www.iom.edu/subpage.asp?id=18065>
www.uninformedconsent.com
<http://www.autismcanada.org/News/Weldon.pdf>

Additional references and resources upon request.