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NUTRIENT AND TOXIC ELEMENT LEVELS AND SYMPTOMS GUIDE

Nutrient & Toxic Element Levels & Symptoms Guide

Nutrient Element	Cause of Imbalance	Signs and Symptoms
Calcium	**LOW LEVELS:** Malnutrition and poor calcium intake, dietary intolerance, hormonal changes (especially in women), genetic factors, medications that decrease absorption. **HIGH LEVELS:** Overactive parathyroid gland, thyroid disease, chronic kidney problems, adrenal dysfunction, fungal infections, certain medications, too much vitamin D, cancer.	**LOW:** Confusion or memory loss, muscle spasms, numbness and tingling in hands, feet and face, depression, hallucinations, muscle cramping, weak and brittle nails, fracturing of bones, slow hair growth and fragile, thin skin. **HIGH:** Poor bone health, kidney stones, abnormal heart and brain function, excessive thirst and frequent urination, abdominal pain, lethargy, anxiety and depression.
Copper	**LOW LEVELS:** May occur secondary to malnutrition or intestinal malabsorption. Measurement of ceruloplasmin is a mandatory prerequisite to supplementation of copper when it is low in erythrocytes. **HIGH LEVELS:** Wilson's disease (a genetic disease where the accumulation of copper in tissues leads to liver and brain damage). High levels may occur during inflammatory responses, with redistribution of copper from the liver to peripheral tissues. In females, some increase may result from estrogen therapy or use of oral or copper IUD contraceptives.. Copper excess can occur when zinc is displaced from functional binding sites. It may also displace molybdenum. Conversely, zinc or molybdenum deficiencies may allow accumulation of copper as does liver disease or biliary insufficiency/obstruction. Most copper is excreted via bile and biliary dysfunction may cause excessive red blood cell copper.	**LOW:** Copper insufficiency signs include fatigue, maldigestion, hair loss, poor night vision and reduced taste. **HIGH:** Fatigue, anemia, dermatitis, metallic taste and loss of appetite, and discoloration of teeth. Decrease zinc and molybdenum serum levels.
Lithium	**LOW LEVELS:** Low absorption and/or impaired uptake is a possibility. **HIGH LEVELS:** Excessive intake of lithium supplementation or medication.	**LOW:** Mood swings, bipolar, mania, high blood serum of B12 (Lithium is needed to get B12 into cells). **HIGH:** Kidney and thyroid damage, diarrhea, vomiting, stomach pains, fatigue, tremors, uncontrollable movements, muscle weakness, drowsiness, weakness, seizures, agitation, rapid heartbeat, hyperthermia, low blood pressure, confusion.
Magnesium	**LOW LEVELS:** Low RBC magnesium can be a result of a poor quality diet, fasting or anorexia, intestinal malabsorption, alcoholism, renal/urinary wasting of magnesium, stress, chronic diarrhea or hyperparathyroid function. **HIGH LEVELS:** Poor renal clearance or renal insufficiency, parenteral overdose and excessive use of oral magnesium salts together with impaired renal clearance.	**LOW:** Fatigue, lack of physical endurance, muscle twitches or tremor, hypertension, constipation, and low mood. **HIGH:** Hypotension, hypothermia, vasodilation, nausea and diarrhea with oral Mg excess, and CNS depression with sleepiness.

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Manganese	**LOW LEVELS:** Poor quality diet, maldigestion or malabsorption. Profuse sweating or diarrhea can reduce body retention of manganese; relatively little manganese is excreted via urine. **HIGH LEVELS:** Drinking water (usually private wells), contaminated foods, and occasionally from therapeutic medications taken over a long period. Biliary insufficiency or obstruction can cause abnormally increased retention and levels of manganese. Documented cases of intoxication from industrial mining, and chemical process industries. Used in paints and coatings, some batteries, industrial catalysts, gasoline (MMT), metal alloy fabrications and glass manufacturing. Street drugs may be contaminated.	**LOW:** Increased allergic or inflammatory responses, fatigue (can become chronic), abnormal blood glucose levels, impaired growth of bone, nails or hair, weight loss, poor blood clotting, hyperaminoacidemia/ hyperaminoaciduria with nitrogen excess, possible hyperammonemia, and arthritic joint symptoms. **HIGH:** Fatigue, headache. Acute intoxication may cause bradykinetic-rigidity syndrome (like Parkinson's disease), 'Manganese Madness' with euphoria and hallucinations. Clinical evidence connects excess to inappropriate aggressive or violent behaviors.
Molybdenum	**LOW LEVELS:** Possibly due to absorption issues. Genetic mutation of CBS enzyme. **HIGH LEVELS:** Exposure to piping and welding materials. Excessive dietary supplementation or dietary intake.	**LOW:** Sulfite intolerance and low uric acid are consistent with molybdenum insufficiency. Also, fatigue, somnolence and amino acid intolerance. Sensitivity to sulfur containing foods like onions and garlic. May cause increase in serum copper. **HIGH:** An increase in serum levels of uric acid and ceruloplasmin may occur; xanthine oxidase, gout-like symptoms, acute psychosis with hallucinations, seizures and neurologic symptoms. Change in copper metabolism.
Selenium	**LOW LEVELS:** Poor quality diet, intestinal malabsorption, or urinary wasting of selenium. **HIGH LEVELS:** Contaminated drinking water and electronic components including photovoltaic cells, batteries and semiconductors. Some inorganic pigments and glazes and vulcanized rubber, metal blueing solutions (gun blues). Dithiocarbamate insecticides and insect repellents may contain selenium. Incorrectly formulated nutritional supplements.	**LOW:** Muscle aches, hypothyroid function, sclerosing of tissue, anemia, increased dental caries, inflammatory response, oxidative stress due to lowered antioxidant activity of glutathione. **HIGH:** Mild elevations of selenium are usually of no clinical significance. Very excessive selenium can have toxic effects and include the following symptoms: fatigue, garlic-like breath, metallic taste, yellowish-to-pink-red discoloration of nails, skin, teeth and eyelids, unstable blood pressure, irregular menses, hair loss, anorexia, or lymphocytosis.
Zinc	**LOW LEVELS:** Intestinal malabsorption, alcoholism, chronic ingestion of highly-processed foods, chronic diarrhea, overuse of diuretics, and nephrotic syndrome. Excess copper interferes with zinc binding in blood plasma and reduces zinc retention. Excess iron intake may impair zinc absorption in the small intestine. **HIGH LEVELS:** Overuse of nutritional zinc supplements, eating or drinking from galvanized containers, zinc-contaminated water or food, continual diet of high-zinc foods (mostly shellfish, mushrooms, yeasts), and industrial exposures.	**LOW:** Incomplete digestive proteolysis, food reactivities, reduced taste, reduced night vision, muscle aches, slowed wound healing, hair loss, dermatitis or sexual impotency. In children, slow growth or stunted growth may occur. May cause increase in serum copper. **HIGH:** Weakness, lethargy and fatigue, impaired fine motor skills, and signs of iron or copper deficiency. Anemia.

Toxic Element	Exposure	Signs and Symptoms
Antimony	Antimony is a toxic element widely used in alloys to increase hardness or strength. **SOURCES:** Solders, metal type (printing), antifriction alloys, ammunition and powders, lead batteries, paints, enamels, glass and pottery glazes, flame retardants, tobacco, rubber agents, mines/smelting operations.	Antimony interferes with cellular metabolism, commonly deposits in erythrocytes and the liver and is mostly excreted via bile and liver. Symptoms are variable and may include metallic taste, anorexia, fatigue, myopathy, gout-like symptoms, MAO dysfunction, hypertension, erythrocyte fragility and angina. Inhalation of Sb may result in nosebleeds, rhinitis, and pneumonitis.
Arsenic	Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. It is highly toxic in its inorganic form. **SOURCES:** Drinking contaminated water, using contaminated water in food preparation and irrigation of food crops, industrial processes, eating contaminated food and smoking tobacco, rodent poisons, contaminated seafood (especially shellfish), treated wood products, some fungicides and pesticides, fireworks, leather tanning and taxidermy, and lead/copper alloys.	Arsenic deposits quickly in liver, kidney, spleen, skin, bone and muscle. In tissues, it binds to selenium, phospholipids or phosphatides, and to sulfur in sulfhydryl groups on proteins, peptides and metabolic cofactors. Excessive arsenic symptoms include garlic breath and increased salivation, fatigue, chest pain, diarrhea, and hypotension. Chronic signs may include hair loss, skin hypopigmentation, white-streaked fingernails, anorexia, peripheral neuropathy.
Cadmium	Cadmium is a cumulative toxin with a biological half-life of 10 to 30 years for the whole body. It is synergistic with lead and mercury and may worsen the toxic effects of either. It may also interfere with zinc functions (as an activator of enzymes). **SOURCES:** CD-plated hardware (nuts and bolts), electroplating processes, Nickel-Cd batteries, brazes and solders, Cd pigments (paints, inks, glazes), cigarettes, old copy machine drums, plastics containing Cd-compounds as heat stabilizers, photographic and engraving chemicals, sewage sludge and power plant exhaust plumes, metal costume jewelry.	Glucosuria, proteinuria, beta2-microblobulinuria, fatigue, hypertension, sexual impotency (males), and microcytic-hypochromic anemia. Increased aging and reduced telomeres. Acute Cd contamination may include increased salivation, nausea, abdominal pain, vomiting, diarrhea, and choking sensations. Acute inhalation leads to tightness of chest, dyspnea and cough, and pulmonary edema.
Cobalt	**SOURCES:** C cobalt/chromium metal-on-metal hip implants, alloys, batteries, drill bits, saw blades and machine tools, dyes and pigments, magnets, tires and is a component of vitamin B12 (cobalamin).	Inhalation of cobalt can lead to chronic lung problems. Chronic cobalt exposure may lead to serious health problems like cardiomyopathy, deafness, nerve problems, tinnitus, thyroid issues vision problems and thickening of blood.
Lead	Lead toxicity is a particularly insidious hazard with the potential of causing irreversible health effects. It interferes with several body functions primarily affecting the central nervous, hematopoietic, hepatic and renal system producing serious disorders. Acute toxicity is related to occupational exposure and is quite uncommon. Chronic toxicity on the other hand is much more prevalent. **SOURCES:** Water pipes and systems, chips from old lead paint, art supplies, colored glass kits, bullets, fishing sinkers, balance weights, radiation shields, lead-acid batteries, bearing alloys, contaminated herbal preparations and teas, certain ceramic glazes or pigments.	Calcium, zinc and/or iron deficiency conditions enhance uptake of ingested lead. In the body, absorbed lead rapidly leaves the blood plasma and accumulates in erythrocytes where it binds to hemoglobin and thiols and to the cell membrane. It can deposit in bone tissue, the aorta, kidneys and other organs. Lead interferes with enzymes that form heme, shortens erythrocyte lifespan, disrupts iron transport in erythropoietic cells, affects renal transport of uric acid, reduces cytochrome P-450 activity in children, and is synergistically toxic with cadmium and mercury. Adults and children may present with anorexia, metallic taste, insomnia, headaches, fatigue, anemia, reticulocytosis, and uricemia.

Toxic Element	Exposure	Signs and Symptoms
Mercury	Human toxicity varies with the form of mercury, the dose and the rate of exposure. The target organ for inhaled mercury vapor (inorganic mercury from amalgams) is primarily the brain, while methyl mercury chiefly damage the gut lining and kidney with wide distribution throughout the body. **SOURCES:** Contaminated shellfish or seafood, contaminated water supply (methylmercury), dental amalgams or working in the dental profession (inorganic mercury), laboratory equipment, barometers, thermometers, mining and smelting operations.	Variable symptoms that may include metallic taste, increased salivation, paresthesia with decreased senses of hearing, touch, and vision, hypertension, headaches, fatigue, insomnia, and fine muscle tremors. Common mercury toxicity symptoms include emotional disturbance, significant mood swings, anger outbursts, excitability and lack of focus and concentration.
Silver	Buildup of silver in tissue can occur over months or years of exposure. **SOURCES:** Colloidal silver products, food and drinking water, medicines, jewelry making, soldering, photography, silver-coated flatware are all possible sources of silver exposure.	Dust exposure causes breathing, lung, throat and stomach problems. Skin contact may cause discoloration, rash, swelling or inflammation. Kidney problems are possible.
Strontium	High blood levels may result from bone supplements containing strontium. While it increases bone density, the benefits are questionable partially due to calcium displacement. *Some "re-mineralizing" toothpastes use a form of fluoride and strontium that can cause that elevation.* For example: https://www.gskhealthpartner.com/en-in/oral-health/brands/sensodyne/science/strontium-acetate/ **SOURCES:** Ceramics and glass products, pyrotechnics, paint pigments, fluorescent lights, bone supplements, and medicines.	Increases the risk of venous thromboembolism, pulmonary embolism, and serious cardiovascular disorders, including myocardial infarction. Risk to kidneys as strontium bioaccumulates in the body.