Other Trace Elements

There are 92 elements that are found in nature with 22 other documented or theoretical elements. In sea water, there are approximately 66 elements that have been identified to date. Each year, as more research is conducted and released to the media and consumers, minerals and trace minerals are garnering more recognition and consideration for the beneficial role they play in human health. During the next few years, experts predict there will continue to be an expansion or "golden-age" of knowledge concerning the essential role of a number of minerals and trace minerals in health and nutrition.

Microelements, or trace minerals, are minerals the body requires in very small, or trace, amounts. Without a steady, minute intake of these trace elements, your body cannot function, and health problems may occur. "Trace minerals, such as chromium, manganese, selenium, vanadium, and copper, have far-reaching health effects as evidenced by current research,"states Chris D. Meletis, dean of naturopathic medicine and chief medical officer at the National College of Naturopathic Medicine in Portland, OR.[1]

Listed below, in alphabetical order, are identified elements that have been studied for their role in health and nutrition.

Aluminum:

The average daily intake varies between 3 to 100 mg. Sources of aluminum (Al) include baked goods prepared with leavening agents, *i.e.* baking powder, processed cheese, grains, vegetables, certain antacids, white flour, etc.[2-3] There is no established function of aluminum in human health.[2] Aluminum, if consumed in high amounts, can be fatal.[3] However according to *Nutrition Almanac*, Adelle Davis, author, speaker and pioneer of America's "Health Food" movement, reported that magnesium can displace aluminum in the body. A patient of Davis' suffering from irritability, poor concentration, and memory due to aluminum toxicity was able to end the symptoms after taking magnesium supplements.[3] Further research is needed.

Arsenic:

Although arsenic (As) is primarily known for its toxic properties, there is some evidence from animal studies to suggest that it plays a unique role in health. Numerous animal studies involving rats, hamsters, goats, and chicks has provided circumstantial evidence that arsenic is essential—in very small amounts. In goats, arsenic deficiency resulted in decreased growth rates, impaired fertility, and increased infant mortality.[4] Based on animals studies that were extrapolated to humans, the dietary intake of arsenic is equal to 12.5-25 mcg/day.[2] Human diets normally contain 12-50 mcg arsenic daily. Nutritionists advise a safe upper intake of arsenic could well be 140-250 mcg/day.[5]

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Beryllium:

This mineral is a component of many industrial processes including electronic devices and some alloys such as steel, bicycle wheels, and other household products. Estimated intakes of this element approximately 100 mcg/day.[6] In industrial toxicology, inhalation of beryllium (Be) dust has led to lung injury, scarring, or fibrosis.[3] However, the literature does not report a case of beryllium toxicity associated with a dietary supplement that contains trace amounts of Be.[6] Some studies have shown that 1 ppm of beryllium chloride prevents calcification of the precursor associated with increased risk of dental caries.[6]

Bismuth:

Bismuth (Bi) has no known function with in the body, but it has been used historically to treat syphilis and, today, is an ingredient in certain anti-diarrhea medications (Pepto-Bismol™) and rectal suppositories. Bismuth toxicity can cause staggering gait, poor memory, tremors, visual and hearing disturbances.[3]

Bromine:

The typical daily intake of bromine (Br) is 2 to 8 mg. Bromide is normally ingested as the bromide ion, which has a low degree of toxicity, and, as such, does not pose a toxicological threat in terms of nutrition. Some studies suggest Br may be nutritionally beneficial (*i.e.,* low Br levels associated with hemodialysis patients with insomnia).[2]

Cadmium:

The typical dietary intake of this element daily is 10-20 mcg.[1] Cadmium (Cd), found in cigarette smoke, industrialization, and population growth, has a long half life (10-30 yrs.), and high intakes can cause organ damage—especially kidney damage. If there is a deficiency of zinc in the diet, the body will compensate, storing cadmium.[2] Cadmium is known to experimentally cause hypertension, cancer, and immune disorders. In prostate cancer, there is a correlation between the grade of malignancy and cadmium content.[6] However, little cadmium is absorbed orally unless there are nutrient deficiencies. Other elements and nutrients that confer a protective effect against cadmium include: zinc, calcium, vitamin C, and sulfur amino acids.[6]

Germanium:

Average daily intakes hover between 0.4-1.5 mg. The maximum safe intake level of germanium (Ge) should be >30 mg per day or 0.43 mg/kg/d for a healthy adults and >7.5 mg per day in a healthy child.[6] Some organic forms of germanium are less toxic than inorganic forms. Inorganic germanium toxicity can result in damage to the kidneys. There have been reports of kidney failure with organic germanium supplements, however, the intake ranged from 16-328 grams over a 4 to 36-month period.[3,6]

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Lead:

Typical daily intakes are 15-100 mcg per day. In animal studies, lead (Pb) deficiency had adverse effects on growth and disturbed iron metabolism. Although beneficial in minute amounts, toxicity is more of a nutritional concern.[1] Humans can only tolerate 1-2 mg of lead without suffering toxic effects including anemia, kidney damage, and central nervous system abnormalities.[2-3]

Mercury:

The average daily intake of mercury is estimated to be 0.5 mg.[3] Mercury (Hg) has no known essential function in the body and is a toxic element presenting numerous hazards if it is ingested or inhaled. Individuals can be exposed to mercury through industrial processes or by consuming contaminated fish or wild game. Currently, there is controversy whether individuals can be exposed to the harmful effects of mercury from mercury-containing fillings. Two forms of mercury, methyl and phenyl mercury, deplete brain tissues of zinc.[3]

Nickel:

An essential element for higher animals, a deficiency disease has not been identified for humans.[7] Average intakes of Western-based diet ranges from 60-260 mcg/day. Nickel, demonstrated through animal and human tests, plays a role in hormone, lipid, and membrane metabolism.[3] It can act as an activator of certain enzymes and may be involved in glucose metabolism.[3] The oral toxic dose is about 1,000 times the amount consumed in food. Nickel can be toxic to humans if intake levels are high. Excessive amounts of nickel in tissue can lead to altered hormone and enzyme activities and can impact glucose tolerance, blood pressure, and immune function.[7]

Phosphorous:

Needed for proper bone and tooth formation, cell growth and contraction of the heart muscle, phosphorous (P) also assists in the assimilation of vitamins and the conversion of food into energy.[2] It also works with calcium to maintain the calcium-phosphorous balance in the bones of 2.5 parts calcium to 1 part phosphorous.[3] The recommended amount is 800 mg/day for men and women. Deficiency can cause lack of appetite and weight loss. There is no known toxicity of phosphorous. There are some studies that have reported supplemental phosphorous enhances athletic performance, but some studies have not replicated the same results. The majority of studies provide some support. Phosphate loading in ten trained distance runners attenuated increases in blood lactate after exercise. Another study reported that 1,000 mg of tribasic sodium phosphate administered four times daily for six days significantly increased maximal oxygen uptake and ventilatory anaerobic thresholding. It did not, however, improve five-mile run times compared with placebo.[8]

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Rubidium:

Typical daily intake of rubidium (Rb) is 1-5 mg. Rubidium is relatively non-toxic and does not pose toxicological concern. In animals, specifically goats, rubidium deficiency depresses growth and life expectancy.[2]

Silicon:

Found in the connective tissue of the body including the aorta, trachea, tendons, bone, and skin, silicon (Si) also works with calcium to form strong bones, which has implications for osteoporosis.[2,3] It also stimulates the immune system and inhibits the aging process in tissues.[2] Aging increases the need for silicon. Recommended intakes range from 5-10 mg/day.[4]

Strontium:

There is minor, circumstantial evidence suggesting strontium (Sr) may be an essential trace mineral; further research is needed.[3] However, strontium is similar to calcium in chemical composition and is necessary for proper bone growth and prevention of dental caries.[3] Researchers at St. Mary's Hospital in Montreal, Canada, have found that strontium may confer a protective effect of certain energy-producing structures with in the cell. Not to be confused with radioactive strontium 90, strontium is stable and one of the least toxic trace elements.[3]

Sulfur:

Sulfur (S) accounts for 0.25 percent of human body weight.[3] Referred to as nature's "beauty mineral," it works with other nutrients, including protein, to support hair glossiness, lustre, and smoothness and help maintain a clear, youthful appearance.[3] Sulfur also plays a role in bacteria resistance, bile secretion, and the aging process.[8] Sulfur is stored in each cell of the body with the highest amounts found in the joints, hair, skin and nails.[3] There is no RDA for sulfur.

Tin:

Tin is a heavy metal that is not considered an essential nutrient for humans. Tin deficiency in animals has resulted in poor growth and hemoglobin synthesis.[3] Widely used in many industrial processes, a tin salt, stannous fluoride, is used in commercial toothpastes.[3] Estimated daily intakes range from 2-17 mg/day; estimated requirements hover between 3-4 mg/day.[3] The typical daily dietary intake ranges from 1-40 mg.[8]

Vanadium:

There is circumstantial evidence for the essentiality of vanadium (V), but it has not yet been established. It is present in most body tissues. Cartilage, bones and teeth require vanadium for proper development. It also plays a role in growth and reproduction and cholesterol synthesis.[8] Animal studies show that vanadium deficiency in increased rates of spontaneous abortion, infant mortality, skeletal

deformities.[2-3,5] Vanadium is a component of many sports performance enhancers and is advertised for its beneficial effects on glucose metabolism.[5] Both experimental and clinical trials demonstrate that vanadium
has significant insulin-mimetic properties, but claims that it promotes increased muscle mass have been refuted by science.[8] High doses of vanadium may be toxic to humans.[4] In animal studies, vanadium toxicity has adverse effects reduced blood glucose levels, diarrhea, red blood cells and caused immunosuppression.[6] Therefore, the use of supplemental vanadium is not indicated for any purpose at this time.[8]

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