Total Element Clearance Profile (Random/Timed)

Great Smokies Diagnostic Laboratory[SM]

63 Zillicoa Street · Asheville, NC 28801-1074
www.gsdl.com

Patient:

Completed:

Age:

Received:

Sex:

Collected:

MRN:

INSTITUUT VOOR FUNCTIONELE GENEESKUNDE B
Nieuweweg 172
6603 BT Wijchen
,
THE NETHERLANDS

Toxic Elements

Element	(µg / L)	Ref Range
Lead	0.37	<= 0.85
Mercury	3.73	<= 1.70
Aluminum	8.7	<= 34.0
Antimony	0.030	<= 0.160
Arsenic	13.7	<= 49.0
Barium	<dl	<= 4.20
Bismuth	<dl	<= 0.380
Cadmium	0.03	<= 0.58
Cesium	3.15	<= 7.60
Gadolinium	<dl	<= 0.020
Gallium	0.42	<= 3.40
Nickel	0.81	<= 8.40
Niobium	0.07	<= 0.02
Platinum	<dl	<= 0.020
Rubidium	0.2	<= 1,559.0
Tellurium	0.099	<= 0.160
Thallium	0.099	<= 0.300
Thorium	<dl	<= 0.000
Tin	0.14	<= 3.50
Tungsten	0.108	<= 0.230
Uranium	<dl	<= 0.014

Nutrient Elements

Element	(µg / L)	Ref Range
Cobalt	0.100	0.100-1.100
Copper	2.60	2.70-33.00
Lithium	0.70	3.80-41.00
Manganese	0.100	0.400-2.300
Molybdenum	20.1	7.6-81.0
Selenium	9.1	10.0-176.0
Zinc	63.4	40.0-749.0

Element	(mg / L)	Ref Range
Calcium	8.5	31.0-226.0
Magnesium	23.5	16.8-128.0
Sulfur	124.2	84.0-857.0

Creatinine Concentration & Urine Volume

Urine Creatinine	10.47 L	30.00-209.00 mg/dL
Urine Total Volume (in milliliters):	1,700	

Provocation Comment

Pre-provocation laboratory results.

Legend

- Reference Range for Toxic Elements
- Reference Range for Nutrient Elements
- Cautionary Level - Result is outside the reference range. Pre-collection dietary variables, supplements or use of challenge substances may be the cause. Such values should be assessed with the individuals symptoms, physical findings,nutritional status and exposure potential in mind.
- Tentative Maximum Permissible Level (TMPL) - Element excretion is elevated. These levels are not strict toxicological points, but represent excessive excretion and therefore potential exposure or body burden of the element which can impact negatively on overall health. The TMPL's for Pb, Hg, Al, Sb, Cd, Ni, Tl, and Co are derived from Casarett and Doull's TOXICOLOGY: The Basic Science of Poisons 5th Ed. 1996 McGraw Hill NY, NY. with standardization of units.

Patient: ID:

Reference Range Information

Element reference ranges were developed from a healthy population under non-provoked/non-challenged conditions. Provocation with challenge substances is expected to raise the urine level of some elements to varying degrees, often into the cautionary or TMPL range. The degree of elevation is dependent upon the element level present in the individual and the binding affinities of the challenge substance.

Commentary

<dl = Unable to determine results due to less than detectable levels of analyte.

Urine creatinine concentration is below the reference range. This may be due to increased fluid intake, a low protein diet, low body weight, or low levels of physical activity. Conditions such as diuretic use, dietary deficiencies of precursor amino acids (arginine, glycine, or methionine), malnutrition, or hypothyroidism may also lower creatinine levels. Measurement of serum creatinine or a creatinine clearance test can help determine if there are changes in renal function.

Mercury is above the reference range. Mercury behaves differently in different body tissues, depending on its chemical form, and interchange between forms can occur in vivo. For elemental and inorganic mercury, biliary excretion predominates with low-level toxicity, but urinary excretion increases and is favored as the degree of exposure and burden increases. For organic mercury (methyl, ethyl, alkyl), bile accounts for about 90% of excretion and urine accounts for about 10%. Significant day-to-day and diurnal variations are typically observed. Urinary excretion of mercury is notably increased following administration of chelating or detoxifying agents (DMSA); intravenous administration of EDTA results in relatively minor urinary increases.

There is great variability in individual tolerances to mercury. In some individuals, relatively low levels can cause immune dysregulation. Lymphocyte inhibition and dysfunction, immunosupression, and autoimmune conditions are documented in animals. At the cellular level, mercury can induce cytotoxicity, oxidative stress (via loss of glutathione function), and increased secretion of beta-amyloid in neuronal cells, linking it to Alzheimer's disease. Outside cells, mercury can bind to and strongly inhibit a cell surface-bound protein called dipeptidylpeptidase IV, CD26, and adenosine deaminase binding protein. Inside cells, mercury binds to lipoic acid, glutathione, coenzyme A and cysteinyl sites, and it can impair pyruvate metabolism and citric acid (Kreb's) cycle function, leading to impaired energy production. Chronic mercury exposure may produce increased excitability and tremor, memory loss, insomnia, lassitude, anorexia and weight loss, gingivitis and stomatitis. Acute mercury vapor exposure may inflame the bronchial tubes and cause pneumonitis. Irreversible neurologic damage is reported in acute mercury toxicity. Inorganic mercury concentrates mostly in kidneys, while organic (methyl) mercury has high affinity for the posterior cortex of the brain.

Mercury sources have increased in the environment, resulting in increased amounts in soils, sediments and bodies of water. Coal-fired power plants emit over 30% of environmentally released mercury. Other industrial sources are chlorine or "chlor-alkali" plants, cement plants, pulp and paper mills, municipal waste incinerators, and hazardous/medical waste incinerators. Fish, shellfish and edible seaweed are possible dietary sources of this element. Other sources include old latex paint, antifungal and antifouling (marine) paints, some fluorescent light tubes and vapor lamps, medicinal products such as those containing "Thimerosal" (sodium ethyl mercurithiosalicylate or mercurothiolate, often contained in routine vaccines), batteries and "calomel" electrodes, electrical switches, thermostats and relays, and scientific or laboratory equipment (thermometers, barometers). Dental amalgams are

Commentary

primarily a source of elemental or amalgamated mercury that is typically found in feces for several days following dental procedures; very little of this dental-procedure mercury appears in urine. However, mercury vapor from in-place amalgam fillings can be absorbed, biotransformed and excreted in urine, but its level is typically much less than that which is attributable to food sources, especially seafood.

Calcium is below the reference range. Possible dietary reasons for low urine calcium include: dietary deficiencies of calcium, vitamin D or vitamin A, protein-deficient diet, and excessive dietary phosphates. Intestinal alkalinity and insufficient acidophilic flora (Lactobacillus) can cause poor uptake of dietary calcium, and consequently, urine levels may be subnormal. Use of thiazide diuretics may decrease renal excretion of calcium. Pathological conditions featuring deficient urinary calcium include: hypoparathyroidism, systemic alkalosis, milk-alkali syndrome (with hypercalcemia and renal calcium retention), and renal failure. In fat malabsorption with steatorrhea, dietary calcium uptake is impaired and low urine calcium may result. Glomerular impairment can be expected to cause hypocalcinuria regardless of blood calcium level.

Copper is below the reference range. Normally, only about one percent of total copper excretion occurs via urine, while 99% is excreted via bile and feces. Thus, the finding of low urine copper may have no clinical significance. However, low urine copper would be consistent with copper deficiency conditions or with renal insufficiency or failure. Assessment of copper status involves measurement of blood or blood cell levels, erythrocyte SOD activity and serum ceruloplasmin.

Lithium is below the reference range. This element is considered to be beneficial at trace levels. Low lithium in individuals often is a function of geography, with certain locales having unusually low lithium in ground water and/or soil. Standard nutritional supplements rarely contain this element, although low-dose lithium is available from some supplement companies and pharmacies.

Manganese is below the reference range. Over 90% of ingested manganese is excreted via bile and feces. Only about 1% of total dietary manganese is excreted in the urine. Problems or conditions that would be consistent with low manganese include diet of highly refined foods, intestinal malabsorption syndromes, and renal insufficiency or failure.

Niobium is above the reference range. Once considered to be rarely encountered except in the metallurgical industry, niobium now is used in stainless steel welding, orthodontics, prostheses, magnets, and experimentally as a superconductor. The corrosion-resistant metal alloy "Inconal" contains this element.

In animal studies, niobium challenges have produced glycosuria, increased body fat and weight, myocardial insufficiency, lethargy, decreased respiration, and liver cell damage. Also in animal studies, exposure to niobium disordered other elemental distributions, causing copper and zinc to deposit in the liver and manganese to deposit in the heart.

Niobium is a common trace element in food and drink with notable levels in tea, coffee, and pepper. The element is also used to manufacture high-temperature steels and iron-aluminum alloys. A new application is niobium-titanium dental wire for orthodontics. Permanent magnets may use the element in their manufacture.

Commentary

Selenium is below the reference range. Selenium is nutritionally essential and low urine selenium can be secondary to dietary deficiency. A diet of highly-processed foods or foods grown in selenium-deficient soils can result in selenium deficiency and correspondingly low urine levels. Gastrointestinal dysfunction or malabsorption may cause poor uptake of selenium.