AYUMETRIX

HEAVY METALS TEST REPORT

Patient Name
John Doe

Patient ID
JD690210

Non-smoker
BMI 45.6 **Waist** 46 in

Medications
None

DOB
2/10/1969 (49 yrs.)

Report Date and Time
10/24/2018 17:00

Gender
M

Received Date and Time
10/15/2018 16:00

Specimen Collection Date and Time

Morning	10/9/2018	09:00
Noon	10/9/2018	12:20
Evening	10/9/2018	16:30
Night	10/9/2018	19:30

Provider ID: 0000
Doctor T
17387 63rd Ave
Lake Oswego, OR 97035
Ph: xxx-xxx-xxxx

Heavy Metal Report

	10/9/2018		Ranges
Li (Lithium)	5	L	8 - 218 µg/g Cr
Mg (Magnesium)	24000		20000 - 200000 µg/g Cr
Zn (Zinc)	956		90 - 1300 µg/g Cr
As (Arsenic)	25		< 50 µg/g Cr
Se (Selenium)	150		30 - 220 µg/g Cr
Cd (Cadmium)	0.5		< 0.8 µg/g Cr
Br (Bromine)	900		700 - 4800 µg/g Cr
I (Iodine)	250		100 - 380 µg/g Cr
Hg (Mercury)	2.6		< 3 µg/g Cr
Cr (Creatinine)	0.9		0.3 - 3.0 mg/mL

Method: ICP-MS, Creatinine by Jaffe Method
<dl: less than detection limit
Results are creatinine corrected to account for urine dilution variations

What do your test results mean?

LITHIUM is found throughout the atmosphere, with significant amounts is sea water, mineral springs and soils. Every organ and tissue in human body contains lithium with particular importance in brain health. In very small amounts lithium is known to be helpful in good mental health. Lithium is typically used in the treatment of bipolar disorder. Possible side effects of excessive lithium include increased thirst, frequent urination, nausea, diarrhea, weight gain, swelling, hair loss. Organs most effected by lithium toxicity include kidneys and thyroid. Lithium deficiency could be associated with symptoms such as anger, irritability, low mood, depression, bipolar disorder, cognitive decline, substance abuse, eating disorders, mood or brain problems.

MAGNESIUM is the fourth most common essential element in the human body after calcium, potassium and sodium. It is required for a multitude of enzymatic reactions, participating in the metabolism of glucids, lipids, proteins and nucleic acids, and particularly in all the reactions involving the formation and use of adenosine triphosphate, an organic chemical that provides energy to drive many processes in living cells. Around 40% of the total body magnesium is intracellular, while the remaining 60% is in bones and teeth. It is estimated that approximately two third of Americans have magnesium intake below the recommended amount; decrease of magnesium intake have also been observed in other countries. This intake decrease has been attributed to several factors including the drop of grain product consumption, agricultural techniques of accelerated growth, use of magnesium-poor soil fertilizers, use of pesticides, refining of food and boiling vegetables. Magnesium deficiency results in several cellular alterations like mitochondrial disorders, muscle weakness, cramping, fatigue, neurological and cardiovascular dysfunctions, reduced bone mineralization and strength. About one third of dietary magnesium is eliminated in urine on average; patients with magnesium deficiency excrete smaller amounts of magnesium in urine.

ZINC is an essential element and has an important role in wound healing, metabolism at the cellular level, immune system and DNA and protein synthesis. High zinc levels can result in symptoms such as nausea, dizziness, vomiting, fatigue, muscle pain, fever and headache. Zinc deficiency can lead to impaired wound healing, skin lesions, delayed growth, seizures, impaired immune function, diarrhea, unexplained weight loss. Zinc deficiency could be caused partly by excess loss of zinc in urine, sickle cell anemia, alcoholism, diabetes or chronic renal diseases. Zinc deficiency is rare in the United States but still happens in a few people. This condition can be reversed through dietary changes and supplements.

ARSENIC Naturally occurring non-toxic organic arsenic compounds, including arsenobetaine, arsenocholine, and arsenosugars, are found in high levels in fish, shellfish, and seaweed. Toxic inorganic arsenic compounds are known to occur naturally in rocks and soil; synthetically in preserved wood, insecticides, herbicides, glass manufacturing, smelting, semiconductors, circuits, and laser technology. The most important exposures occur in areas with high levels of inorganic arsenic in groundwater, and thus by contamination of drinking and crop irrigation water. Inorganic arsenic exposure occurs most frequently through ingestion and inhalation. After absorption, arsenic is mainly distributed to the kidneys and liver and can accumulate in skin, hair, and nails. Arsenic is cleared rapidly from the blood, not significantly stored in internal organs, and excreted by the kidneys. Therefore, urine testing is the best means of assessing any kind of arsenic exposure. Most arsenic is eliminated within 96 h after the last exposure. Acute exposure to arsenic could cause symptoms such as severe abdominal pain, nausea or vomiting, bloody diarrhea, headache, weakness, shock, hypotension, congestive heart failure etc. A level of >75 μg/g creatinine of arsenic represents a potentially toxic value. However, the test results are frequently confounded by the presence of nontoxic organic arsenic compounds from seafood. Any seafood ingested within a week of the laboratory test will cause a false positive result. High urinary arsenic levels should be confirmed by retesting after eliminating any and all seafood one week before taking the test.

SELENIUM is an important mineral, which plays a significant role in processes like thyroid hormone metabolism, reproduction, DNA synthesis, and protection from infection. Selenium deficiency has been associated with symptoms such as fatigue, muscle weakness, mental fog, hair loss, weakened immune system. Urinary selenium concentrations are used as an indicator of selenium status. A strong correlation has been established between dietary selenium and daily urinary selenium excretion in a wide range of populations from all over the world with different dietary selenium intake. Selenium excretion rates of 20-200 micrograms/day are not associated with deficiency or toxicity problems. Urinary Se excretion is decreased in children, elderly people, and pregnant women.

CADMIUM is extremely hazardous to human health and classified as a group I carcinogen by the World Health Organization's International Agency for Research on Cancer. Cadmium is found in the environment from a variety of anthropogenic sources: wastewater, industrial air emission and widespread use of fertilizers on agricultural soils. Dietary intake is the major exposure of this toxic element for non-smokers through crops grown in contaminated soils. Inhalation from smoking tobacco, industrial activities (fossil fuel combustion, waste incineration) and occupational exposure (smelting, manufacturing) also represents significant exposures. Once inside the body, cadmium binds to albumin and metallothionein in the circulation and is filtered by the kidneys where it bioaccumulates, making kidneys the target organ impacted by chronical exposure. Cadmium has other negative effects on human health, such as damage of thyroid tissues and infertility in both men and women through a variety of mechanisms. Urinary cadmium is a good measure of long-term exposure of this compound and body burden. Urinary cadmium correlates with tissue levels in kidneys, and total T4, total T3, free T3 and thyroglobulin.

BROMINE is known to have no essential function for the human body. However, an excess of bromine can inhibit iodine utilization creating a state of iodine deficiency. When bromine binds to iodine receptors in the thyroid gland, it disrupts its normal physiological functioning. Exposure of bromine occurs via medications, food treated with pesticides, water purifiers and fire-retardant agents. Bromine can cause dullness, difficulties to concentrate, depression, headaches and irritability. Bromine is mostly excreted through urine.

IODINE is an essential component of the thyroid hormones T3 and T4. Effects of iodine deficiency include pregnancy complications, goiter, compromised thyroid hormone production, mental impairment and decreased cognitive function. Developing fetus and small children are especially at risk from iodine deficiency: iodine deficiency causes mental delays due to the inadequate thyroid hormone delivery to the developing brain. An excess of iodine also leads to thyroid deficiency. Iodine is consumed through dairy products, seafood, iodized salt and grains. Since 90% of dietary iodine is eliminated in urine within 24-48 hours, recent iodine uptake is accurately measure via urinary analysis, allowing iodine levels to be corrected if necessary.

MERCURY is one of the most toxic heavy metals in the environment. Populations are primarily exposed to mercury via food, but also dental amalgam still used in some countries. The toxicity of mercury depends on its chemical form, either it is elemental, inorganic or organic. These forms are widely present in water sources like lakes, oceans and rivers where they are absorbed and transformed into methyl mercury by microorganisms. Microorganisms are then consumed by marine animals, the major source of human exposure through dietary ingestion. Methyl mercury is lipophilic; the higher concentrations are found old fatty predatory fish species such as tuna, halibut and redfish. Methyl mercury is a well-known potent neurotoxin which causes adverse impacts on the developing human brain. Exposure during pregnancy is of a great concern for the fetus since this compound passes readily through the placental barrier and blood-brain barrier. Children born of exposed parents experience severe disturbance of nervous functions and developmental delays. The brain been the main target, methyl mercury is also considered to be potentially cancerogenic, can cause impairment on any organ and lead to malfunctioning of nerves, kidneys and muscles.