LAB #: B000000-0000-0
PATIENT: Sample Patient
ID: PATIENT-S-00000
SEX: Male
DOB: AGE: 6

CLIENT #: 12345
DOCTOR:
Doctor's Data, Inc.
3755 Illinois Ave.
St. Charles, IL 60174 U.S.A.

Toxic & Essential Elements; Whole Blood

ESSENTIAL AND OTHER ELEMENTS					PERCENTILE 2.5th 16th 50th 84th 97.5th
		RESULT	UNIT	REFERENCE INTERVAL	
Calcium	(Ca)	**5.8**	**mg/dL**	5- 7.4	
Magnesium	(Mg)	**3.5**	**mg/dL**	3- 4.2	
Copper	(Cu)	**102**	**µg/dL**	70- 120	
Zinc	(Zn)	**422**	**µg/dL**	400- 680	
Manganese	(Mn)	**13**	**µg/L**	4- 21	
Chromium	(Cr)	**0.27**	**µg/L**	0.2- 0.80	
Lithium	(Li)	**0.8**	**µg/L**	0.4- 20	
Selenium	(Se)	**208**	**µg/L**	115- 280	
Strontium	(Sr)	**10**	**µg/L**	10- 40	
Molybdenum	(Mo)	**1.3**	**µg/L**	0.3- 2.6	
Vanadium	(V)	**0.08**	**µg/L**	0.04- 0.30	

TOXIC METALS					PERCENTILE 95th 99th
		RESULT	UNIT	REFERENCE INTERVAL	
Arsenic	(As)	**1.8**	**µg/L**	< 6.0	
Barium	(Ba)	**0.5**	**µg/L**	< 4.0	
Cadmium	(Cd)	**< 0.1**	**µg/L**	< 0.5	
Cobalt	(Co)	**1.0**	**µg/L**	< 0.8	
Lead	(Pb)	**1.2**	**µg/dL**	< 2.0	
Mercury	(Hg)	**0.8**	**µg/L**	< 2.0	
Nickel	(Ni)	**< 1.5**	**µg/L**	< 3.0	
Platinum	(Pt)	**< 0.05**	**µg/L**	< 0.10	
Thallium	(Tl)	**< 0.05**	**µg/L**	< 0.50	
Tungsten	(W)	**< 0.03**	**µg/L**	< 0.10	
Uranium	(U)	**< 0.02**	**µg/L**	< 0.10	

SPECIMEN DATA

Comments:

Date Collected: **06/13/2017**
Date Received: **06/19/2017**
Date Reported: **06/20/2017**

Time Collected: **10:00 AM**
Fasting:

Methodology: **ICP-MS**

Blood lead levels in the range of 5-9 µg/dL have been associated with adverse health effects in children aged 6 years and younger.

LAB #: B000000-0000-0
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St. Charles, IL 60174 U.S.A.

Essential Elements; Serum

ESSENTIAL ELEMENTS		RESULT/UNIT		REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Calcium	(Ca)	**9.8**	mg/dL	8.9- 10.3	
Magnesium	(Mg)	**1.9**	mg/dL	1.7- 2.5	
Sodium	(Na)	**140**	mEq/L	135- 145	
Potassium	(K)	**4.3**	mEq/L	3.5- 5.0	
Phosphorus	(P)	**4.6**	mg/dL	3.7- 6.5	
Iron	(Fe)	**128**	µg/dL	35- 165	

INFORMATION

Sodium and Potassium
Sodium (Na^+) and potassium (K^+) are electrolytes that affect most metabolic functions. They serve to maintain osmotic pressure and hydration of various body fluid compartments, body pH and regulation of heart and muscle functions. Electrolytes are also involved in oxidation-reduction reactions and participate in essential enzymatic reactions. Electrolytes can be affected by state of hydration. Hemolysis can result in falsely elevated K^+.

Magnesium
Magnesium (Mg) is a major intracellular cation that is involved in over three hundred enzymatic reactions in the body. Little is known about the factors affecting serum Mg, but the parathyroid gland appears to be involved. Low serum Mg levels may be associated with poor diet/malabsorption, diabetes, hyperthyroidism, hypoparathyroidism, myocardial infarction, congestive heart failure, liver cirrhosis, alcoholism and diuresis. Increased serum Mg levels may be associated with renal failure, dehydration, severe diabetic acidosis, and Addison's disease.

Calcium
Although 99% of calcium exists in bones and teeth, serum calcium (Ca) is of greatest clinical concern. Ca regulates transmission of nerve impulses, muscle contraction, coagulation, and numerous enzymatic reactions. The uptake and release of Ca from bone is regulated by parathyroid hormone, and serum Ca levels are inversely proportional to phosphorus levels. Low serum Ca results in muscle tetany while high Ca levels result in lowered neuromuscular excitability, muscle weakness, and other more complex symptoms. Marked variations in serum Ca may result from parathyroid gland or bone disease, poor diet/intestinal absorption of calcium (vitamin D), kidney disease, and other abnormalities.

Inorganic Phosphorus
Measurements of serum inorganic phosphorus (phosphate or PO_4) are used in the diagnosis and treatment of disorders including parathyroid gland and kidney diseases, and vitamin D status. Serum PO_4 is regulated by coordinated efforts of vitamin D and parathyroid hormone, and PO_4 levels are inversely proportional to Ca levels. Low PO_4 may be associated with fatigue, paresthesias and muscle weakness, while elevated PO_4 may be associated with hypoparathyroidism, hyperthyroidism, hypocalcemia and tetany.

Iron
Measurements of non-heme, serum iron (Fe) are used in the diagnosis and treatment of diseases such as Fe deficiency anemia, Fe toxicity and acute or chronic hemochromatosis. The most comprehensive assessment of Fe status includes transferrin saturation and ferritin.

SPECIMEN DATA

Comments:

Date Collected: **06/13/2017**
Date Received: **06/19/2017**
Date Completed: **06/19/2017**

Time Collected: **10:00 AM**
Fasting:

Methodology: **Na, K ISE**
Ca, Mg, P, Fe Spectrophotometry

v08.10

WHOLE BLOOD ELEMENT REPORT

INTRODUCTION

This analysis of elements in whole blood was performed by ICP Mass Spectroscopy following specimen digestion with nitric acid in a closed container microwave oven system. This procedure measures the total concentration of an element in whole blood, regardless of biochemical form and regardless of partitioning of the element in blood fractions. For units of measurement, mg/L is approximately equivalent to ppm, and mcg/L is approximately equivalent to ppb.

Whole blood element analysis is intended to be a diagnostic method that assists in determining imbalance, insufficiency, or excess of certain elements that have essential or beneficial functions. Additional testing of blood fractions or other body tissues may be necessary for differential diagnosis of imbalances. Additional testing also may be necessary to assess specific dysfunctions of assimilation, transport, retention, or excretion of elements. Whole blood element analysis is additionally intended to determine elevated or excessive levels of eleven potentially toxic elements.

If an element is sufficiently abnormal per the whole blood measurement, a descriptive text is included with the report. For elements with essential or beneficial functions, a text will print if the measured result is below -1.5 standard deviations from the mean of the reference population, or if the result is above +1.5 standard deviations from the mean of the reference population.
For potentially toxic elements, a text prints whenever the measured result exceeds the expected range.

Doctor's Data states the reference range as + 1SD from the mean of the reference population. This is considered to be the nutritionally and physiologically optimal range for elements with essential or beneficial functions. Physiological imbalance corresponds to levels beyond + 1SD but pathological consequences are not expected until the blood level is beyond + 2SD. Element levels beyond + 2SD may only be temporary nutritional problems or they may reflect a failure of homeostasis to control blood quantities. Pathological consequences depend upon cell and tissue functions which are disrupted by such levels.

ZINC LOW

The concentration of Zinc (Zn) is abnormally low in this blood specimen.
Zinc is an activator or cofactor for many enzymatic steps in human metabolism. Digestive enzymes (carboxypeptidase, carnosinase, and aminopeptidase) require Zn; an important enzyme controlling chemical energy conversion (lactate dehydrogenase) requires Zn, as do alcohol dehydrogenase and carbonic anhydrase. The cytosolic form of the oxidant-response mediating enzyme, superoxide dismutase, is activated by zinc and copper. Zinc is distributed widely throughout the body; about one-fifth of total body stores of Zn are in skin. Plasma or serum Zn concentration normally varies from about 0.6 to 1.3 mg/dl; RBC Zn varies from 0.9 to 1.6 mg/dl; and whole blood is a combination of both. This combination includes Zn being transported in serum (bound to albumin, other proteins, and to amino acids) and Zn bound to cellular enzyme proteins.

Clinical and causative conditions associated with Zn deficiency include:

incomplete digestive proteolysis and malabsorption, chronic diarrhea, overuse of diuretics, alcoholism, hepatic cirrhosis, renal tubular disease and nephrotic syndrome, and diabetes mellitus. Excess dietary phosphates, phytates, fiber, calcium and copper can impair uptake of dietary Zn. Excess copper levels also can interfere with Zn retention by competition for albumin binding sites. Certain hyperaminoaciduria conditions, measured by 24-hour urine amino acid analysis, are reported to coincide with depleted Zn in blood. Zn binds to cysteine and histidine. Cystinuria or histidinuria enhances urinary Zn excretion. Therapeutic detoxification procedures, e.g. EDTA chelation and D penicillamine therapy, have a propensity to deplete body stores of Zn.

Conditions seen in Zn deficiency are: altered taste, impaired dark adaptation by the eyes, partial alopecia, poor wound healing, sexual impotency, acral dermatitis, delayed growth in children, dwarfism, and immune dysfunction with impaired Tlymphocyte activity. Elevated lactic acid in blood (lacticacidosis) may occur in zinc deficiency, and testosterone may be low.

Other laboratory tests that may be diagnostic for suspected Zn deficiency are: RBC Zn, serum lactic acid (mildly elevated in Zn deficiency), erythrocyte SOD activity determination (subnormal in either Zn or Cu deficiency), and erythrocyte carbonic anhydrase activity (subnormal in Zn deficiency).

BIBLIOGRAPHY FOR ZINC, LOW

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2. Zinc in Human Medicine, Proceedings of a Symposium on the Role of Zinc in Health and Disease, Inst. Child Health (London), TIL Pub Ltd, Toronto, Canada, 1984.

3. Jacobs D.S.et al, Laboratory Test Handbook, Williams & Wilkins, Baltimore MD,1990, pp367-68.

4. Martin D.W. et al, Harper's Review of Biochemistry, 20th ed, Lange Med. Pub, Los Altos CA, 1985, p. 659.

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STRONTIUM LOW

The concentration of strontium (Sr) is lower than average in this blood specimen. Sr is chemically similar to calcium and is assimilated by plants and animals along with calcium. Studies with chicks show that vitamin D controls Sr

assimilation just as it does for calcium. It is very probable that Sr assists in bone and calciferous tissue formation in humans, and clinical studies have been reported about treatment of osteoporosis with low doses of stable Sr 88. Controlled studies with animals have shown stimulation of bone formation with low levels of Sr in drinking water.

Low Sr in whole blood may reflect problems with calcium assimilation or vitamin D activity. Calcium and vitamin D levels themselves should be examined as primary indicators of bone mineralization. With normal calcium assimilation and normal vitamin D activity, a finding of low whole blood Sr may be of no clinical significance. A finding of low blood Sr and low blood Ca is suggestive of a calcium-deficient diet, vitamin D insufficiency or inactivation, or some overall problem with Ca assimilation.

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COBALT HIGH

The concentration of cobalt (Co) in this blood sample is higher than expected. Co is an integral constituent of vitamin B-12, but only constitutes about 4% of cobalamines (B-12) by weight. Elevated blood Co provides an indication of higher than average exposure to inorganic Co. Blood Co may be slightly elevated in association with very high dose supplementation with B-12.

Plants are generally low in Co and higher levels are found in meats and certain seafoods. Co is used in the manufacture of alloys for strength and heat resistance in the aeronautical, electronics and auto industries. The absorption of inhaled Co occurs rapidly at about 30% (occupational exposure), and orally between 5-45%. The oral absorption of Co and iron is competitive.

The toxicity of Co is relatively low. Nevertheless, ingestion or inhalation of

large doses may lead to pathological disorders. The main clinical manifestations of acute Co poisoning (rare) are pulmonary edema, allergy, nausea, vomiting, and hemorrhage. Chronic, sub-threshold toxicity may be associated with pulmonary syndrome, skin syndrome, gastrointestinal irritations (oral), nausea, cardiomyopathy, hematological disorders and thyroid lesion. Such effects would not be expected to be associated with therapeutic administration of methylcobalamine.