LAB #: B000000-0000-0
PATIENT: Sample Patient
ID: PATIENT-S-00016
SEX: Female
AGE: 34

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

Toxic & Essential Elements; Whole Blood

ESSENTIAL AND OTHER ELEMENTS		RESULT / UNIT	REFERENCE INTERVAL	PERCENTILE (2.5th, 16th, 50th, 84th, 97.5th)
Calcium	(Ca)	**5.2 mg/dL**	4.6- 6.2	
Magnesium	(Mg)	**3.8 mg/dL**	2.8- 4.0	
Copper	(Cu)	**93 µg/dL**	65- 120	
Zinc	(Zn)	**629 µg/dL**	480- 780	
Manganese	(Mn)	**9 µg/L**	6- 19	
Lithium	(Li)	**0.2 µg/L**	0.4- 20	
Selenium	(Se)	**219 µg/L**	160- 400	
Strontium	(Sr)	**10 µg/L**	9- 45	
Molybdenum	(Mo)	**1.4 µg/L**	0.7- 3.0	

TOXIC METALS		RESULT / UNIT	REFERENCE INTERVAL	PERCENTILE (95th, 99th)
Arsenic	(As)	**5.4 µg/L**	< 9.0	
Barium	(Ba)	**0.2 µg/L**	< 5.0	
Cadmium	(Cd)	**0.6 µg/L**	< 2.0	
Cobalt	(Co)	**0.4 µg/L**	< 1.5	
Lead	(Pb)	**0.4 µg/dL**	< 3.0	
Mercury	(Hg)	**1.3 µg/L**	< 5.0	
Nickel	(Ni)	**< 3 µg/L**	< 5	
Platinum	(Pt)	**< 0.2 µg/L**	< 2.0	
Silver	(Ag)	**< 0.1 µg/L**	< 2.0	
Thallium	(Tl)	**< 0.1 µg/L**	< 1.0	
Uranium	(U)	**< 0.1 µg/L**	< 1.0	

SPECIMEN DATA

Comments:

Date Collected: **11/28/2011**
Date Received: **11/30/2011**
Date Completed: **12/8/2011**

Time Collected: **10:15 AM**
Fasting: **Yes**

Methodology: **ICP-MS**

v8.10

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.

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Essential Elements; Serum

ESSENTIAL ELEMENTS		RESULT/UNIT		REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Calcium	(Ca)	**9.1**	mg/dL	8.6- 10.3	
Magnesium	(Mg)	**2.0**	mg/dL	1.7- 2.5	
Sodium	(Na)	**138**	mEq/L	133- 145	
Potassium	(K)	**3.5**	mEq/L	3.5- 5.0	
Phosphorus	(P)	**3.7**	mg/dL	2.5- 5.0	
Iron	(Fe)	**115**	µg/dL	50- 200	

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: **11/28/2011**
Date Received: **11/30/2011**
Date Completed: **12/1/2011**

Time Collected: **10:15 AM**
Fasting: **Yes**

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 elevn 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.

LITHIUM LOW

The concentration of lithium (Li) in this blood specimen is lower than expected. Li occurs almost universally in water and in the diet, and Li has essential functions in the body.

Intracellularly, Li inhibits the conversion of phosphorylated inositol to free inositol. In the nervous system this moderates neuronal excitability. Li also influences monamine neurotransmitter concentrations at the synapse (this function is increased when Li is used therapeutically for mania or bipolar illness). Recent studies suggest that long-term, low dose Li supplementation is neuroprotective and may help preserve integrity of the central nervous system with aging.

Bibliography for Lithium, low

1. Williams RSB , Harwood AJ. ” Lithium therapy and signal transduction”. Trends in Pharmacol. Sci. (2000)21:61-64.

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4. Chuang DM et al. ”Beta-amyloid peptide-induced death of PC 12 cells and cerebellar granule neurons is inhibited by long-term lithium treatment”. Eur. J. Pharmacol. (2000)392:117-23.

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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1. Marie P.J. et al ”Histomorphometry of Bone Changes in Stable Strontium Therapy” in Trace Substances in Environmental Health -XIX, Proceedings of the U. of Missouri 19th Annual Conference on Trace Substances in Environmental Health, ed. by D.D. Hemphill, U.of Missouri, Columbia MO, June 1985.

2. Blumsohn A. et al. ”Stable Strontium Absorption as a Measure of Intestinal Calcium Absorption...” Clin. Sci (Colch), 87 no.3, Sept.1994, pp 363-68.

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