

Patient: **SAMPLE**
PATIENT

DOB: J

Sex:

MRN:

3001 NutrEval Plasma - Plasma and Blood

Results Overview



Functional Imbalance Scores

Key

0-4

: Minimal Need for Support

5-7

: Moderate Need for Support

8-10

: High Need for Support

Need for Antioxidant Support	Need for Mitochondrial Support	Need for Inflammation Support	Need for Reduced Exposure	Need for Methylation Support
Oxidative Stress	Mitochondrial Dysfunction	Omega Imbalance	Toxic Exposure	Methylation Imbalance
4	6	7	0	6
Cyst(e)ine ● Lipid Peroxides ● 8-OHdG ● Glutathione ▼ Taurine ▼ Citric Acid ● cis-Aconitic Acid ▼	Glutathione ▼ CoQ10 ● Magnesium ● FIGLU ▲ Methylmalonic Acid ● Glutaric Acid ● Lactic Acid ▼ Pyruvic Acid ▼ Citric Acid ● cis-Aconitic Acid ▼ Isocitric Acid ● α-Ketoglutaric Acid ● Succinic Acid ● Malic Acid ▲ Adipic Acid ● Suberic Acid ▲ Manganese ●	Omega-3 Index ▼ Omega 6/3 Ratio ● α-Linolenic Acid ● Arachidonic Acid ● Linoleic Acid ● γ-Linolenic Acid ▲ Dihomo-γ-linolenic Acid ▼	Lead ● Mercury ● α-Hydroxyisobutyric Acid ● α-Ketophenylacetic Acid ● Arsenic ● Cadmium ● Pyroglutamic Acid ▲ Orotic Acid ● Citric Acid ● cis-Aconitic Acid ▼ Isocitric Acid ● Glutaric Acid ●	Methylmalonic Acid ● Methionine ● Glutathione ▼ FIGLU ▲ Sarcosine ● Vanilmandelic Acid ● Arginine ● Glycine ● Serine ● Creatinine ●

Nutrient Need Overview

	Nutrient Need											DRI	Suggested Recommendations	Provider Recommendations
	0	1	2	3	4	5	6	7	8	9	10			
Antioxidants														
Vitamin A												2,333 IU	3,000 IU	
Vitamin C												75 mg	500 mg	
Vitamin E / Tocopherols												22 IU	100 IU	
α-Lipoic Acid													200 mg	
CoQ10													30 mg	
Glutathione														
Plant-based Antioxidants														
B-Vitamins														
Thiamin - B1												1.1 mg	10 mg	
Riboflavin - B2												1.1 mg	10 mg	
Niacin - B3												14 mg	30 mg	
Pyridoxine - B6												1.3 mg	50 mg	
Biotin - B7												30 mcg	100 mcg	
Folate - B9												400 mcg	1,200 mcg	
Cobalamin - B12												2.4 mcg	1,000 mcg	
Minerals														
Magnesium												320 mg	400 mg	
Manganese												1.8 mg	3.0 mg	
Molybdenum												45 mcg	75 mcg	
Zinc												8 mg	10 mg	
Essential Fatty Acids														
Omega-3 Fatty Acids												500 mg	1,000 mg	
GI Support														
Digestive Support/Enzymes													0 IU	
Microbiome Support/Probiotics													10 billion CFU	

Amino Acids (mg/day)

Arginine	51	Methionine	0	Recommendations for age and gender-specific supplementation are set by comparing levels of nutrient functional need to optimal levels as described in the peer-reviewed literature. They are provided as guidance for short-term support of nutritional deficiencies only. The Nutrient Need Overview is provided at the request of the ordering practitioner. Any application of it as a therapeutic intervention is to be determined by the ordering practitioner.
Asparagine	0	Phenylalanine	0	
Cysteine	0	Serine	0	
Glutamine	0	Taurine	0	
Glycine	0	Threonine	0	
Histidine	0	Tryptophan	0	
Isoleucine	0	Tyrosine	0	
Leucine	0	Valine	0	
Lysine	0			

Interpretation At-A-Glance

Antioxidant Needs

Vitamin A / Carotenoids



0

- Beta-carotene & other carotenoids are converted to vitamin A (retinol), involved in vision, antioxidant & immune function, gene expression & cell growth.
- Vitamin A deficiency may occur with chronic alcoholism, zinc deficiency, hypothyroidism, or oral contraceptives containing estrogen & progestin.
- Deficiency may result in night blindness, impaired immunity, healing & tissue regeneration, increased risk of infection, leukoplakia or keratosis.
- Food sources include cod liver oil, fortified cereals & milk, eggs, sweet potato, pumpkin, carrot, cantaloupe, mango, spinach, broccoli, kale & butternut squash.

Vitamin C



6

- Vitamin C is an antioxidant (also used in the regeneration of other antioxidants). It is involved in cholesterol metabolism, the production & function of WBCs and antibodies, and the synthesis of collagen, norepinephrine and carnitine.
- Deficiency may occur with oral contraceptives, aspirin, diuretics or NSAIDs.
- Deficiency can result in scurvy, swollen gingiva, periodontal destruction, loose teeth, sore mouth, soft tissue ulcerations, or increased risk of infection.
- Food sources include oranges, grapefruit, strawberries, tomato, sweet red pepper, broccoli and potato.

Vitamin E / Tocopherols



0

- Alpha-tocopherol (body's main form of vitamin E) functions as an antioxidant, regulates cell signaling, influences immune function and inhibits coagulation.
- Deficiency may occur with malabsorption, cholestyramine, colestipol, isoniazid, orlistat, olestra and certain anti-convulsants (e.g., phenobarbital, phenytoin).
- Deficiency may result in peripheral neuropathy, ataxia, muscle weakness, retinopathy, and increased risk of CVD, prostate cancer and cataracts.
- Food sources include oils (olive, soy, corn, canola, safflower, sunflower), eggs, nuts, seeds, spinach, carrots, avocado, dark leafy greens and wheat germ.

 α -Lipoic Acid

8

- α -Lipoic acid plays an important role in energy production, antioxidant activity (including the regeneration of vitamin C and glutathione), insulin signaling, cell signaling and the catabolism of α -keto acids and amino acids.
- High biotin intake can compete with lipoic acid for cell membrane entry.
- Optimal levels of α -lipoic acid may improve glucose utilization and protect against diabetic neuropathy, vascular disease and age-related cognitive decline.
- Main food sources include organ meats, spinach and broccoli. Lesser sources include tomato, peas, Brussels sprouts and brewer's yeast.

CoQ10



0

- CoQ10 is a powerful antioxidant that is synthesized in the body and contained in cell membranes. CoQ10 is also essential for energy production & pH regulation.
- CoQ10 deficiency may occur with HMG-CoA reductase inhibitors (statins), several anti-diabetic medication classes (biguanides, sulfonylureas) or beta-blockers.
- Low levels may aggravate oxidative stress, diabetes, cancer, congestive heart failure, cardiac arrhythmias, gingivitis and neurologic diseases.
- Main food sources include meat, poultry, fish, soybean, canola oil, nuts and whole grains. Moderate sources include fruits, vegetables, eggs and dairy.

Glutathione



5

- Glutathione (GSH) is composed of cysteine, glutamine & glycine. GSH is a source of sulfate and plays a key role in antioxidant activity and detoxification of toxins.
- GSH requirement is increased with high-fat diets, cigarette smoke, cystinuria, chronic alcoholism, chronic acetaminophen use, infection, inflammation and toxic exposure.
- Deficiency may result in oxidative stress & damage, impaired detoxification, altered immunity, macular degeneration and increased risk of chronic illness.
- Food sources of GSH precursors include meats, poultry, fish, soy, corn, nuts, seeds, wheat germ, milk and cheese.

Plant-based Antioxidants



4

- Oxidative stress is the imbalance between the production of free radicals and the body's ability to readily detoxify these reactive species and/or repair the resulting damage with anti-oxidants.
- Oxidative stress can be endogenous (energy production and inflammation) or exogenous (exercise, exposure to environmental toxins).
- Oxidative stress has been implicated clinically in the development of neurodegenerative diseases, cardiovascular diseases and chronic fatigue syndrome.
- Antioxidants may be found in whole food sources (e.g., brightly colored fruits & vegetables, green tea, turmeric) as well as nutraceuticals (e.g., resveratrol, EGCG, lutein, lycopene, ginkgo, milk thistle, etc.).

KEY



Function of Nutrient



Cause of Deficiency



Complications of Deficiency



Food Sources of Nutrient

Interpretation At-A-Glance

B-Vitamin Needs

Thiamin - B1

3

- B1 is a required cofactor for enzymes involved in energy production from food, and for the synthesis of ATP, GTP, DNA, RNA and NADPH.
- Low B1 can result from chronic alcoholism, diuretics, digoxin, oral contraceptives and HRT, or large amounts of tea & coffee (contain anti-B1 factors).
- B1 deficiency may lead to dry beriberi (e.g., neuropathy, muscle weakness), wet beriberi (e.g., cardiac problems, edema), encephalopathy or dementia.
- Food sources include lentils, whole grains, wheat germ, Brazil nuts, peas, organ meats, brewer's yeast, blackstrap molasses, spinach, milk & eggs.

Riboflavin - B2

0

- B2 is a key component of enzymes involved in antioxidant function, energy production, detoxification, methionine metabolism and vitamin activation.
- Low B2 may result from chronic alcoholism, some anti-psychotic medications, oral contraceptives, tricyclic antidepressants, quinacrine or adriamycin.
- B2 deficiency may result in oxidative stress, mitochondrial dysfunction, low uric acid, low B3 or B6, high homocysteine, anemia or oral & throat inflammation.
- Food sources include milk, cheese, eggs, whole grains, beef, chicken, wheat germ, fish, broccoli, asparagus, spinach, mushrooms and almonds.

Niacin - B3

5

- B3 is used to form NAD and NADP, involved in energy production from food, fatty acid & cholesterol synthesis, cell signaling, DNA repair & cell differentiation.
- Low B3 may result from deficiencies of tryptophan (B3 precursor), B6, B2 or Fe (cofactors in B3 production), or from long-term isoniazid or oral contraceptive use.
- B3 deficiency may result in pellagra (dermatitis, diarrhea, dementia), neurologic symptoms (e.g., depression, memory loss), bright red tongue or fatigue.
- Food sources include poultry, beef, organ meats, fish, whole grains, peanuts, seeds, lentils, brewer's yeast and lima beans.

Pyridoxine - B6

8

- B6 (as P5P) is a cofactor for enzymes involved in glycogenolysis & gluconeogenesis, and synthesis of neurotransmitters, heme, B3, RBCs and nucleic acids.
- Low B6 may result from chronic alcoholism, long-term diuretics, estrogens (oral contraceptives and HRT), anti-TB meds, penicillamine, L-DOPA or digoxin.
- B6 deficiency may result in neurologic symptoms (e.g., irritability, depression, seizures), oral inflammation, impaired immunity or increased homocysteine.
- Food sources include poultry, beef, beef liver, fish, whole grains, wheat germ, soybean, lentils, nuts & seeds, potato, spinach and carrots.

Biotin - B7

0

- Biotin is a cofactor for enzymes involved in functions such as fatty acid synthesis, mitochondrial FA oxidation, gluconeogenesis and DNA replication & transcription.
- Deficiency may result from certain inborn errors, chronic intake of raw egg whites, long-term TPN, anticonvulsants, high-dose B5, sulfa drugs & other antibiotics.
- Low levels may result in neurologic symptoms (e.g., paresthesias, depression), hair loss, scaly rash on face or genitals or impaired immunity.
- Food sources include yeast, whole grains, wheat germ, eggs, cheese, liver, meats, fish, wheat, nuts & seeds, avocado, raspberries, sweet potato and cauliflower.

Folate - B9

9

- Folate plays a key role in coenzymes involved in DNA and SAMe synthesis, methylation, nucleic acids & amino acid metabolism and RBC production.
- Low folate may result from alcoholism, high-dose NSAIDs, diabetic meds, H2 blockers, some diuretics and anti-convulsants, SSRIs, methotrexate, trimethoprim, pyrimethamine, triamterene, sulfasalazine or cholestyramine.
- Folate deficiency can result in anemia, fatigue, low methionine, increased homocysteine, impaired immunity, heart disease, birth defects and CA risk.
- Food sources include fortified grains, green vegetables, beans & legumes.

Cobalamin - B12

8

- B12 plays important roles in energy production from fats & proteins, methylation, synthesis of hemoglobin & RBCs, and maintenance of nerve cells, DNA & RNA.
- Low B12 may result from alcoholism, malabsorption, hypochlorhydria (e.g., from atrophic gastritis, H. pylori infection, pernicious anemia, H2 blockers, PPIs), vegan diets, diabetic meds, cholestyramine, chloramphenicol, neomycin or colchicine.
- B12 deficiency can lead to anemia, fatigue, neurologic symptoms (e.g., paresthesias, memory loss, depression, dementia), methylation defects or chromosome breaks.
- Food sources include shellfish, red meat, poultry, fish, eggs, milk and cheese.

KEY



Function of Nutrient



Cause of Deficiency



Complications of Deficiency



Food Sources of Nutrient

Interpretation At-A-Glance

Mineral Needs

Magnesium

0

- Magnesium is involved in >300 metabolic reactions. Key areas include energy production, bone & ATP formation, muscle & nerve conduction and cell signaling.
- Deficiency may occur with malabsorption, alcoholism, hyperparathyroidism, renal disorders (wasting), diabetes, diuretics, digoxin or high doses of zinc.
- Low Mg may result in muscle weakness/spasm, constipation, depression, hypertension, arrhythmias, hypocalcemia, hypokalemia or personality changes.
- Food sources include dark leafy greens, oatmeal, buckwheat, unpolished grains, chocolate, milk, nuts & seeds, lima beans and molasses.

Manganese

3

- Manganese plays an important role in antioxidant function, gluconeogenesis, the urea cycle, cartilage & bone formation, energy production and digestion.
- Impaired absorption of Mn may occur with excess intake of Fe, Ca, Cu, folic acid, or phosphorous compounds, or use of long-term TPN, Mg-containing antacids or laxatives.
- Deficiency may result in impaired bone/connective tissue growth, glucose & lipid dysregulation, infertility, oxidative stress, inflammation or hyperammonemia.
- Food sources include whole grains, legumes, dried fruits, nuts, dark green leafy vegetables, liver, kidney and tea.

Molybdenum

0

- Molybdenum is a cofactor for enzymes that convert sulfites to sulfate, and nucleotides to uric acid, and that help metabolize aldehydes & other toxins.
- Low Mo levels may result from long-term TPN that does not include Mo.
- Mo deficiency may result in increased sulfite, decreased plasma uric acid (and antioxidant function), deficient sulfate, impaired sulfation (detoxification), neurologic disorders or brain damage (if severe deficiency).
- Food sources include buckwheat, beans, grains, nuts, beans, lentils, meats and vegetables (although Mo content of plants depends on soil content).

Zinc

0

- Zinc plays a vital role in immunity, protein metabolism, heme synthesis, growth & development, reproduction, digestion and antioxidant function.
- Low levels may occur with malabsorption, alcoholism, chronic diarrhea, diabetes, excess Cu or Fe, diuretics, ACE inhibitors, H2 blockers or digoxin.
- Deficiency can result in hair loss and skin rashes, also impairments in growth & healing, immunity, sexual function, taste & smell and digestion.
- Food sources include oysters, organ meats, soybean, wheat germ, seeds, nuts, red meat, chicken, herring, milk, yeast, leafy and root vegetables.

Essential Fatty Acid Needs

Need for Omega-3s

7

- Omega-3 (O3) and Omega-6 (O6) fatty acids are polyunsaturated fatty acids that cannot be synthesized by the human body. They are classified as essential nutrients and must be obtained from dietary sources.
- The standard American diet is much higher in O6 than O3 fatty acids. Deficiency of EFAs may result from poor dietary intake and/or poor conversion from food sources.
- EFA deficiency is associated with decreased growth & development of infants and children, dry skin/rash, poor wound healing, and increased risk of infection, cardiovascular and inflammatory diseases.
- Dietary sources of the O6 Linoleic Acid (LA) include vegetable oils, nuts, seeds and some vegetables. Dietary sources of the O3 a-Linolenic Acid (ALA) include flaxseeds, walnuts, and their oils. Fish (mackerel, salmon, sardines) are the major dietary sources of the O3 fatty acids EPA and DHA.

KEY

- Function of Nutrient
- Cause of Deficiency
- Complications of Deficiency
- Food Sources of Nutrient

Interpretation At-A-Glance

Microbiome & Digestive Support

Microbiome Support/Probiotics

0

- Probiotics have many functions. These include: production of some B vitamins and vitamin K; enhance digestion & absorption; decrease severity of diarrheal illness; modulate of immune function & intestinal permeability.
- Alterations of gastrointestinal microflora may result from C-section delivery, antibiotic use, improved sanitation, decreased consumption of fermented foods and use of certain drugs.
- Some of the diseases associated with microflora imbalances include: IBS, IBD, fibromyalgia, chronic fatigue syndrome, obesity, atopic illness, colic and cancer.
- Food sources rich in probiotics are yogurt, kefir and fermented foods.

Digestive Support/Enzymes

0

- Pancreatic enzymes are secreted by the exocrine glands of the pancreas and include protease/peptidase, lipase and amylase.
- Pancreatic exocrine insufficiency may be primary or secondary in nature. Any indication of insufficiency warrants further evaluation for underlying cause (i.e., celiac disease, small intestine villous atrophy, small bowel bacterial overgrowth).
- A high functional need for digestive enzymes suggests that there is an impairment related to digestive capacity.
- Determining the strength of the pancreatic enzyme support depends on the degree of functional impairment. Supplement potency is based on the lipase units present in both prescriptive and non-prescriptive agents.

Functional Imbalances

Mitochondrial Dysfunction

6

- Mitochondria are a primary site of generation of reactive oxygen species. Oxidative damage is considered an important factor in decline of physiologic function that occurs with aging and stress.
- Mitochondrial defects have been identified in cardiovascular disease, fatigue syndromes, neurologic disorders such as Parkinson's and Alzheimer's disease, as well as a variety of genetic conditions. Common nutritional deficiencies can impair mitochondrial efficiency.

Need for Methylation

6

- Methylation is an enzymatic process that is critical for both synthesis and inactivation. DNA, estrogen and neurotransmitter metabolism are all dependent on appropriate methylation activity.
- B vitamins and other nutrients (methionine, magnesium, selenium) functionally support catechol-O-methyltransferase (COMT), the enzyme responsible for methylation.

Toxic Exposure

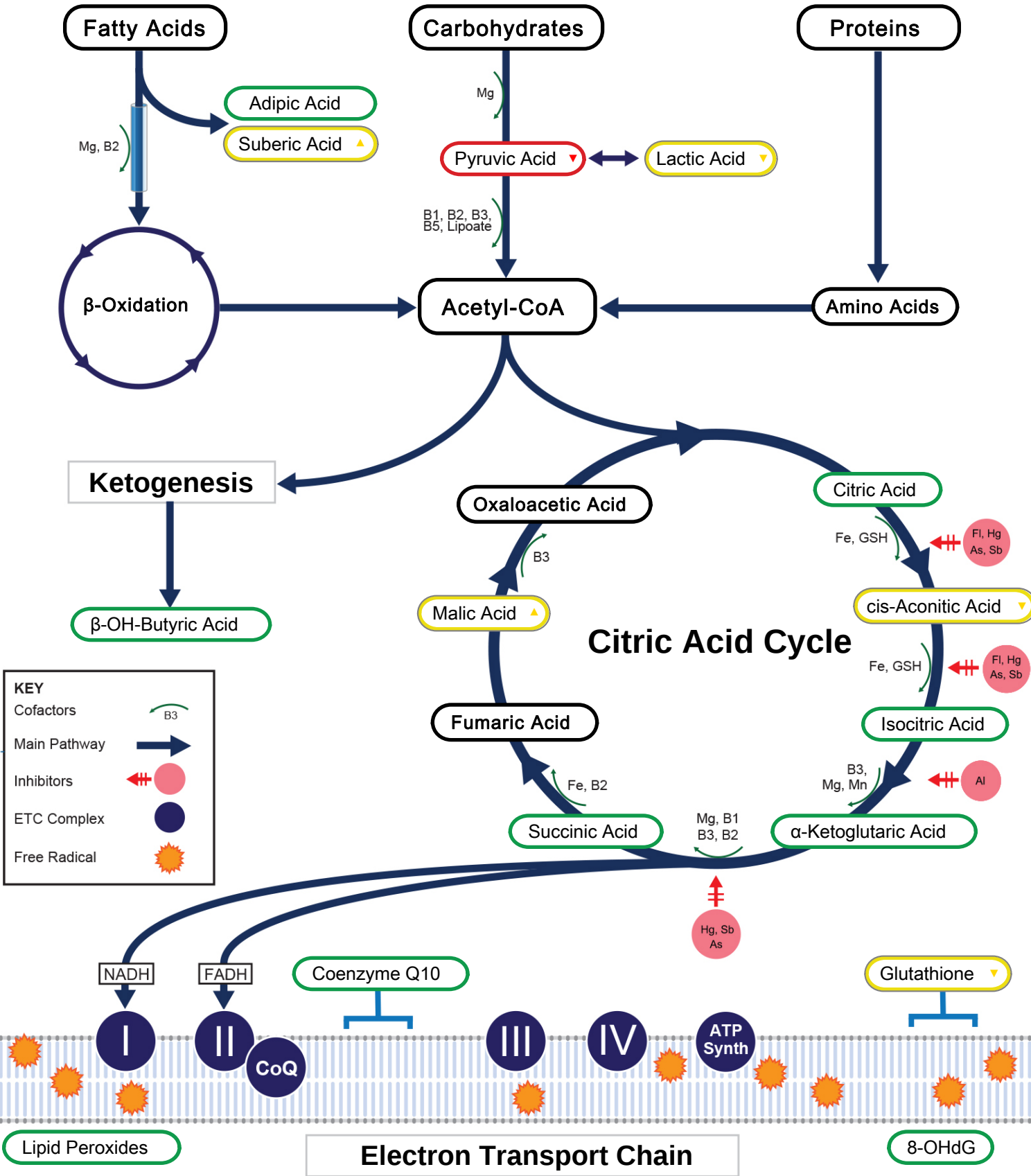
0

- Methyl tert-Butyl Ether (MTBE) is a common gasoline additive used to increase octane ratings, and has been found to contaminate ground water supplies where gasoline is stored. Inhalation of MTBE may cause nose and throat irritation, as well as headaches, nausea, dizziness and mental confusion. Animal studies suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage and nervous system effects.
- Styrene is classified by the US EPA as a "potential human carcinogen," and is found widely distributed in commercial products such as rubber, plastic, insulation, fiberglass, pipes, food containers and carpet backing.
- Levels of these toxic substances should be examined within the context of the body's functional capacity for methylation and need for glutathione.

KEY

- Function of Nutrient
- Cause of Deficiency
- Complications of Deficiency
- Food Sources of Nutrient

Oxidative Stress & Mitochondrial Dysfunction



All biomarkers reported in mmol/mol creatinine unless otherwise noted.

Organic Acids			
Malabsorption & Dysbiosis Markers		Vitamin Markers	
Malabsorption Markers	Reference Range	Branched-Chain Catabolites (B1, B2, B3, ALA)	Reference Range
Indoleacetic Acid	1.1	α-Ketoadipic Acid	0.6
Phenylacetic Acid	0.06	α-Ketoisovaleric Acid	0.23
Dysbiosis Markers		α-Ketoisocaproic Acid	0.18
Dihydroxyphenylpropionic Acid (DHPPA)	2.5	α-Keto-β-Methylvaleric Acid	0.7
3-Hydroxyphenylacetic Acid	5.0	Glutaric Acid	0.25
4-Hydroxyphenylacetic Acid	10	Isovalerylglycine	3.5
Benzoic Acid	0.02	Methylation Markers (Folate, B12)	
Hippuric Acid	360	Formiminoglutamic Acid (FIGlu)	1.6
Yeast / Fungal Dysbiosis Markers		Methylmalonic Acid	0.8
D-Arabinitol	15	Biotin Markers	
Citramalic Acid	3.1	3-Hydroxypropionic Acid	7
Tartaric Acid	<dl	3-Hydroxyisovaleric Acid	3
Cellular Energy & Mitochondrial Markers		Neurotransmitter Metabolites	
Fatty Acid Metabolism	Reference Range	Kynurenine Markers (Vitamin B6)	Reference Range
Adipic Acid	1.1	Kynurenic Acid	6.6
Suberic Acid	1.1	Quinolinic Acid	1.8
Carbohydrate Metabolism		Kynurenic / Quinolinic Ratio	3.67
Pyruvic Acid	3	Xanthurenic Acid	0.83
Lactic Acid	2.0	Catecholamine Markers	
α-Hydroxybutyric Acid	0.55	Homovanillic Acid	2.6
β-OH-Butyric Acid	1.1	Vanilmandelic Acid	1.5
β-OH-β-Methylglutaric Acid	2	3-Methyl-4-OH-phenylglycol	0.07
Energy Metabolism		Serotonin Markers	
Citric Acid	200	5-OH-indoleacetic Acid	9.9
cis-Aconitic Acid	10	Toxin & Detoxification Markers	
Isocitric Acid	45	Pyroglutamic Acid	29
α-Ketoglutaric Acid	15	α-Ketophenylacetic Acid (from Styrene)	0.19
Succinic Acid	1.0	α-Hydroxyisobutyric Acid (from MTBE)	3.9
Malic Acid	1.4	Orotic Acid	0.62
Methodology: GCMS, LC/MS/MS, Alkaline Picrate, Colorimetric		Organic Acid Reference Ranges are Age Specific	

Organic Acids							
Oxalate Markers			Reference Range	Creatinine Concentration			Reference Range
Glyceric Acid		12.4	3.5-16.4	Creatinine ♦		8.0	3.1-19.5 mmol/L
Glycolic Acid		16	<= 67				
Oxalic Acid		25	<= 78				
All biomarkers reported in mmol/mol creatinine.							

Antioxidants		Reference Range	Oxidative Damage		Reference Range
Glutathione (whole blood)		>= 669 micromol/L	Lipid Peroxides (urine)		<= 10.0 micromol/g Creat.
Coenzyme Q10, Ubiquinone (serum)		0.43-1.49 mcg/mL	8-OHdG (urine)		<= 15 mcg/g Creat.
The Oxidative Stress reference ranges are based on an adult population.					

The diagram illustrates the methyl cycle, which involves the conversion of methylmalonyl CoA to succinic acid and glutamate to glutamic acid. The process is divided into two main pathways:

- Methylmalonyl CoA Pathway:** Methylmalonyl CoA is converted to Methylmalonic Acid. This step is reversible and involves the enzyme MMA Mutase, which is dependent on Vitamin B12. Methylmalonic Acid is then converted to Succinic Acid.
- Glutamate Pathway:** Glutamate is converted to Glutamic Acid. This step is reversible and involves the enzyme Glutamate Formiminotransferase, which is dependent on Tetrahydrofolate (THF). Glutamic Acid is then converted to Succinic Acid.

The final product of both pathways is Succinic Acid, which enters the Citric Acid Cycle.

The diagram illustrates the metabolic pathway of branched-chain amino acids. On the left, three amino acids (Valine, Leucine, and Isoleucine) are shown in green rounded rectangles. Arrows point from each to its corresponding α -ketoacid (also in green rounded rectangles): Valine to α -Ketoisovaleric Acid, Leucine to α -Ketoisocaproic Acid, and Isoleucine to α -Keto- β -Methylvaleric Acid. An arrow from α -Ketoisocaproic Acid points to a large blue rectangle labeled "Branched Chain α -Ketoacid Dehydrogenase". To the right of this rectangle, a curved arrow indicates the requirement for cofactors: B1, B2, B3, B5, and Lipoate. From the bottom of the blue rectangle, two arrows point to the "Krebs Cycle": one labeled "Acetyl-CoA" and the other labeled "Succinic Acid".

All biomarkers reported in micromoles per deciliter unless stated otherwise.

Amino Acids (Plasma)				
Nutritionally Essential Amino Acids			Intermediary Metabolites	
Amino Acid		Reference Range	B-Vitamin Markers	Reference Range
Arginine	7.5	6.0-17.5	α-Aminoadipic Acid	0.06 ≤ 0.28
Histidine	9.1	6.5-13.3	α-Amino-N-butyric Acid	5.40 1.76-9.99
Isoleucine	9.43	5.79-18.69	β-Aminoisobutyric Acid	0.40 ≤ 0.72
Leucine	18.8	12.1-36.1	Cystathionine	0.27 ≤ 0.09
Lysine	23.3	13.7-34.7	Urea Cycle Markers	
Methionine	4.5	2.3-6.5	Citrulline	4.2 1.6-5.7
Phenylalanine	9.39	6.07-17.46	Ornithine	9.41 4.38-15.42
Taurine	5.85	4.41-10.99	Urea ♦	535 216-1,156
Threonine	15.22	6.42-16.32	Glycine/Serine Metabolites	
Tryptophan	5.66	2.65-6.67	Glycine	12 5-23
Valine	32.9	18.3-42.6	Serine	5.5 2.1-7.0
Nonessential Protein Amino Acids			Ethanolamine	0.55 0.19-0.78
Amino Acid		Reference Range	Phosphoethanolamine	0.19 0.15-0.64
Alanine	28	23-62	Phosphoserine	<DL ≤ 0.39
Asparagine	8.3	3.5-11.6	Sarcosine	0.10 ≤ 0.15
Aspartic Acid	<DL	≤ 0.67	Dietary Peptide Related Markers	
Cyst(e)ine	9.3	5.9-19.9		Reference Range
γ-Aminobutyric Acid	<DL	≤ 0.06	1-Methylhistidine	0.19 ≤ 1.64
Glutamic Acid	3.1	2.0-14.5	3-Methylhistidine	0.25 ≤ 0.78
Glutamine	64	44-111	β-Alanine	0.3 ≤ 0.7
Proline	32	15-57		
Tyrosine	9.8	6.2-18.5		

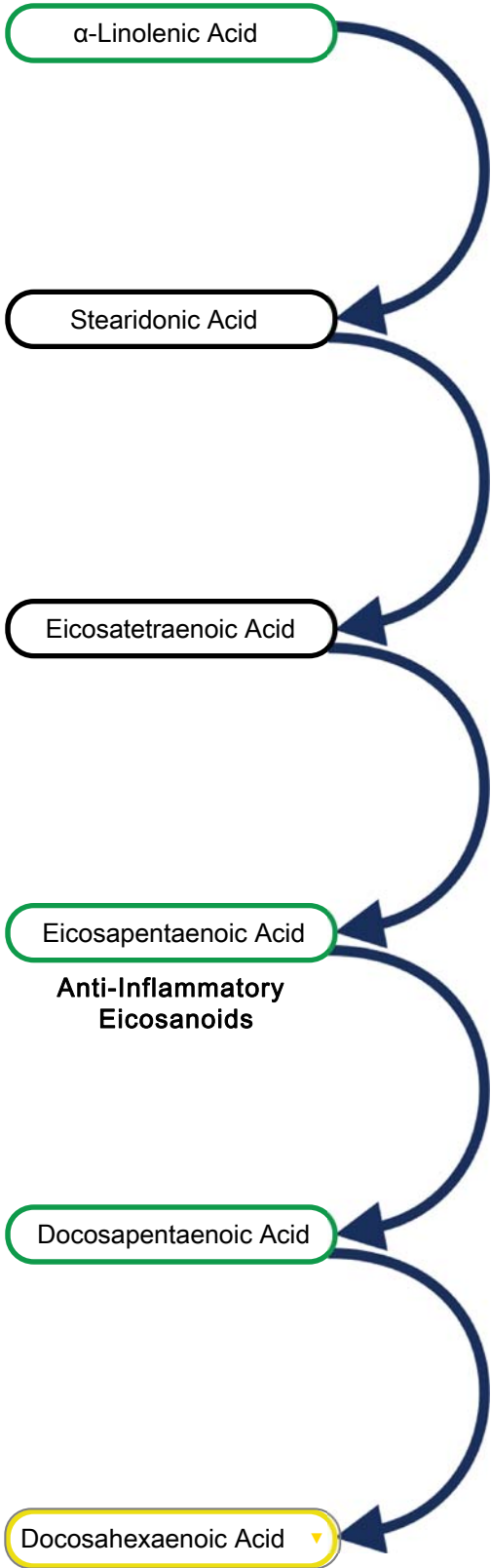
Amino Acid reference ranges are age specific.
Methodology: LC/MS/MS

Methodology: GCMS

Essential & Metabolic Fatty Acids Markers (RBCs)			
Omega-3 Fatty Acids		Omega-6 Fatty Acids	
Analyte	Reference Range	Analyte	Reference Range
(cold water fish, flax, walnut)		(vegetable oil, grains, most meats, dairy)	
α-Linolenic (ALA) 18:3 n3	0.15 >= 0.09 wt %	Linoleic (LA) 18:2 n6	14.9 10.5-16.9 wt %
Eicosapentaenoic (EPA) 20:5 n3	0.38 >= 0.16 wt %	γ-Linolenic (GLA) 18:3 n6	0.11 0.03-0.13 wt %
Docosapentaenoic (DPA) 22:5 n3	1.69 >= 1.14 wt %	Dihomo-γ-linolenic (DGLA) 20:3 n6	0.82 >= 1.19 wt %
Docosahexaenoic (DHA) 22:6 n3	2.7 >= 2.1 wt %	Arachidonic (AA) 20:4 n6	18 15-21 wt %
% Omega-3s	4.9 >= 3.8	Docosatetraenoic (DTA) 22:4 n6	2.07 1.50-4.20 wt %
Omega-9 Fatty Acids		Eicosadienoic 20:2 n6	0.24 ≤ 0.26 wt %
Analyte	Reference Range	% Omega-6s	36.4 30.5-39.7
(olive oil)		Monounsaturated Fatty Acids	
Oleic 18:1 n9	13 10-13 wt %	Omega-7 Fatty Acids	
Nervonic 24:1 n9	2.8 2.1-3.5 wt %	Palmitoleic 16:1 n7	0.29 ≤ 0.64 wt %
% Omega-9s	15.8 13.3-16.6	Vaccenic 18:1 n7	1.02 ≤ 1.13 wt %
Saturated Fatty Acids		Trans Fats	
Analyte	Reference Range	Elaidic 18:1 n9t	0.34 ≤ 0.59 wt %
(meat, dairy, coconuts, palm oils)		Delta-6-Desaturase Activity	
Palmitic C16:0	20 18-23 wt %	Upregulated Functional Impaired	
Stearic C18:0	18 14-17 wt %	Linoleic / DGLA 18:2 n6 / 20:3 n6	18.1 6.0-12.3
Arachidic C20:0	0.32 0.22-0.35 wt %	Cardiovascular Risk	
Behenic C22:0	0.86 0.92-1.68 wt %	Analyte	Reference Range
Tricosanoic C23:0	0.18 0.12-0.18 wt %	Omega-6s / Omega-3s	7.4 3.4-10.7
Lignoceric C24:0	1.8 2.1-3.8 wt %	AA / EPA 20:4 n6 / 20:5 n3	48 12-125
Pentadecanoic C15:0	0.13 0.07-0.15 wt %	Omega-3 Index	3.1 ≥ 4.0
Margaric C17:0	0.33 0.22-0.37 wt %	The Essential Fatty Acid reference ranges are based on an adult population.	
% Saturated Fats	41.3 39.8-43.6		

Fatty Acid Metabolism

Omega-3 Metabolism



Enzyme

Delta-6-Desaturase
Important Regulators:
B2, B3, B6, Vitamin C,
Insulin, Zn, Mg

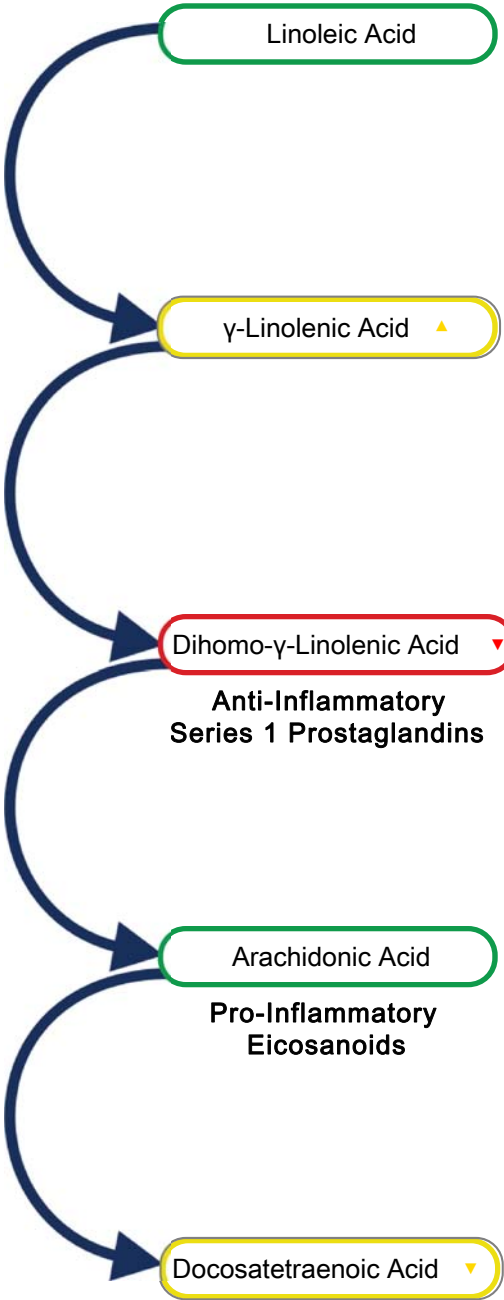
Elongase
Important Regulators:
B3, B5, B6, Biotin,
Vitamin C

Delta-5-Desaturase
Important Regulators:
B2, B3, B6, Vitamin C,
Insulin, Zn, Mg

Elongase
Important Regulators:
B3, B5, B6, Biotin,
Vitamin C

Elongase
Delta-6-Desaturase

Omega-6 Metabolism



Methodology: ICP-MS

Elemental Markers					
Nutrient Elements			Toxic Elements*		
Element		Reference Range	Element		Reference Range
Copper (plasma)	99.2	75.3-192.0 mcg/dL	Lead	1.20	<= 2.81 mcg/dL
Magnesium (RBC)	45.9	30.1-56.5 mcg/g	Mercury	0.58	<= 4.35 mcg/L
Manganese (whole blood)	9.8	3.0-16.5 mcg/L	Arsenic	<DL	<= 13.7 mcg/L
Potassium (RBC)	2,877	2,220-3,626 mcg/g	Cadmium	0.18	<= 1.22 mcg/L
Selenium (whole blood)	175	109-330 mcg/L	* All toxic Elements are measured in whole blood. The reference ranges for Lead, Mercury, and Cadmium are derived from the 95th percentile from NHANES		
Zinc (plasma)	83.7	64.3-159.4 mcg/dL			

The Elemental reference ranges are based on an adult population.

Elemental testing performed by Genova Diagnostics, Inc. 3425 Corporate Way, Duluth, GA 30096 - Robert M. David, PhD, Lab Director - CLIA Lic. #11D0255349 - Medicare Lic. #34-8475

Commentary

For more information regarding NutrEval clinical interpretation, please refer to the NutrEval Support Guide at www.gdx.net/nutrevalguide.