GENOVA DIAGNOSTICS

63 Zillicoa Street
Asheville, NC 28801
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NutrEval Plasma amino acids

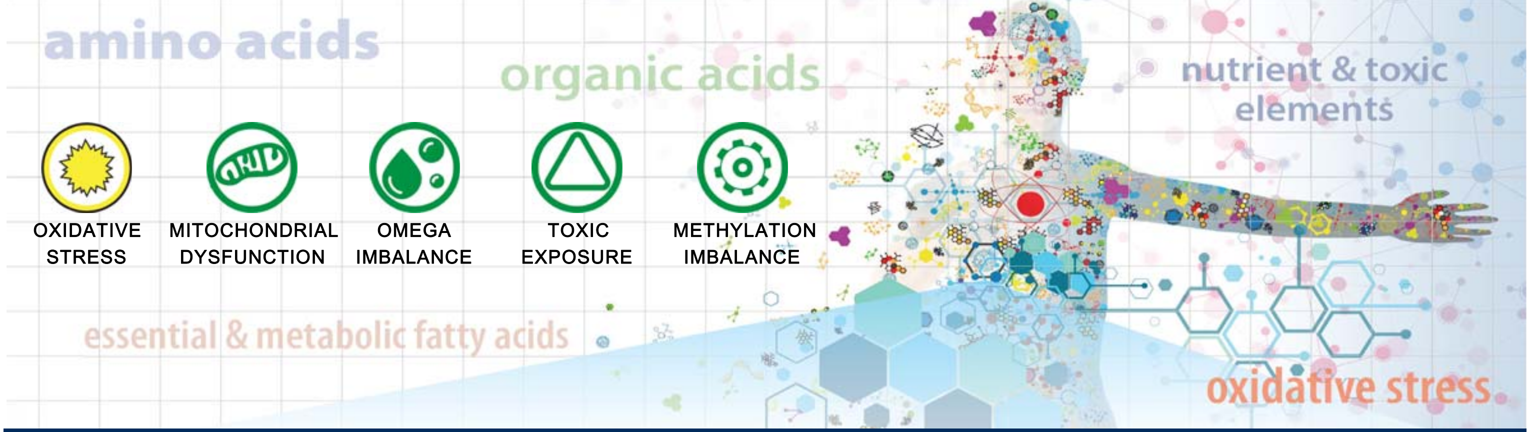
Patient: **STACY YEGN**
DOB: June 16, 1971
Sex: F
MRN: 0003104267

Order Number: T9080601
Reported: November 26, 2024
Received: November 08, 2024
Collected: November 06, 2024

Wellington Provider Group
Matthew Dawson MD
535 Wellington Way Ste 330
Lexington, KY 40503-1331

3001 NutrEval Plasma - Urine 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

Oxidative Stress

6

Cyst(e)ine	●
Lipid Peroxides	△
8-OHdG	●
Glutathione	▽
Taurine	▽
Citric Acid	●
cis-Aconitic Acid	▽

Need for Mitochondrial Support

Mitochondrial Dysfunction

4

Glutathione	▽
CoQ10	N/A
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	△

Need for Inflammation Support

Omega Imbalance

3

Omega-3 Index	▽
Omega 6/3 Ratio	●
α-Linolenic Acid	●
Arachidonic Acid	●
Linoleic Acid	△
γ-Linolenic Acid	●
Dihomo-γ-linolenic Acid	▽

Need for Reduced Exposure

Toxic Exposure

3

Lead	●
Mercury	●
α-Hydroxyisobutyric Acid	●
α-Ketophenylacetic Acid	●
Arsenic	●
Cadmium	●
Pyroglutamic Acid	●
Orotic Acid	●
Citric Acid	●
cis-Aconitic Acid	▽
Isocitric Acid	●
Glutaric Acid	●

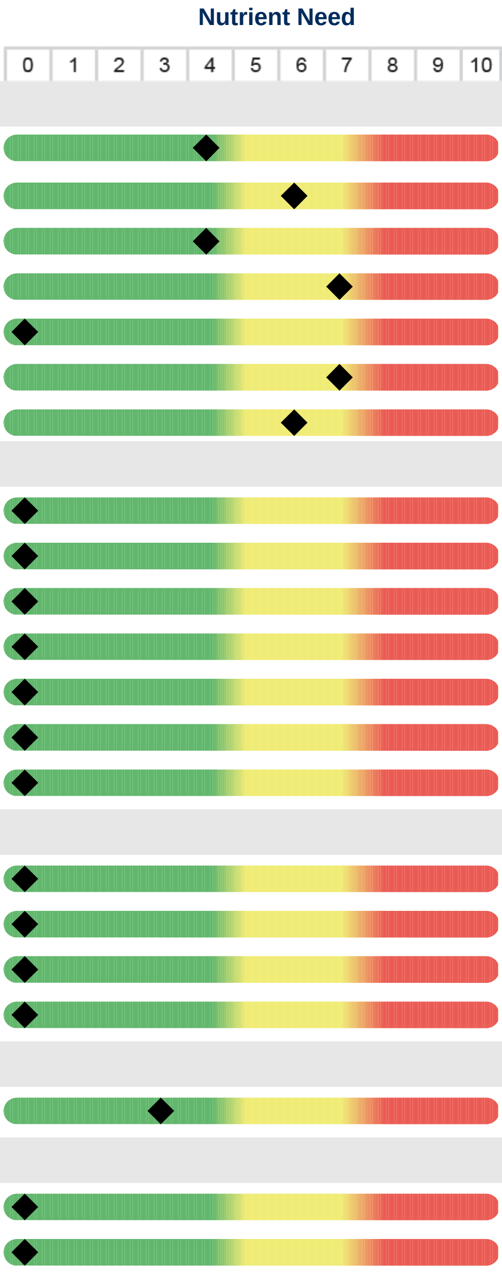
Need for Methylation Support

Methylation Imbalance

4

Methylmalonic Acid	●
Methionine	●
Glutathione	▽
FIGLU	●
Sarcosine	●
Vanilmandelic Acid	●
Arginine	●
Glycine	●
Serine	●
Creatinine	●

Nutrient Need Overview



	DRI	Suggested Recommendations	Provider Recommendations
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		100 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	20 mg	
Pyridoxine - B6	1.5 mg	10 mg	
Biotin - B7	30 mcg	100 mcg	
Folate - B9	400 mcg	400 mcg	
Cobalamin - B12	2.4 mcg	100 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	500 mg	
GI Support			
Digestive Support/Enzymes		0 IU	
Microbiome Support/Probiotics		10 billion CFU	

Amino Acids (mg/day)

Arginine	0	Methionine	0
Asparagine	0	Phenylalanine	0
Cysteine	0	Serine	0
Glutamine	46	Taurine	61
Glycine	348	Threonine	0
Histidine	0	Tryptophan	0
Isoleucine	0	Tyrosine	0
Leucine	0	Valine	0
Lysine	0		

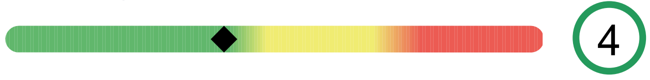
Recommendations for age and gender-specific supplementation are set by comparing levels of nutrient functional need to optimal levels as described in the peer-reviewed literature. They are provided as guidance for short-term support of nutritional deficiencies only.

Any application of the Nutrient Need Overview as a therapeutic intervention is to be determined by the ordering practitioner.

Interpretation At-A-Glance

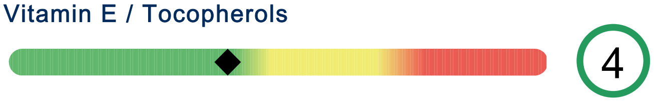
Antioxidant Needs

Vitamin A / Carotenoids



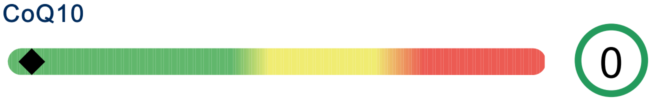
- 🔵 Beta-carotene & other carotenoids are converted to vitamin A (retinol), involved in vision, antioxidant & immune function, gene expression & cell growth.
- 🟢 Vitamin A deficiency may occur with chronic alcoholism, zinc deficiency, hypothyroidism, or oral contraceptives containing estrogen & progestin.
- 🟣 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 E / Tocopherols



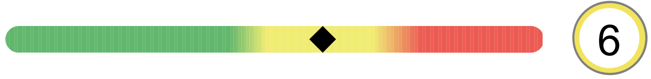
- 🔵 Alpha-tocopherol (body's main form of vitamin E) functions as an antioxidant, regulates cell signaling, influences immune function and inhibits coagulation.
- 🟢 Deficiency may occur with malabsorption, cholestyramine, colestipol, isoniazid, orlistat, olestra and certain anti-convulsants (e.g., phenobarbital, 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.

CoQ10



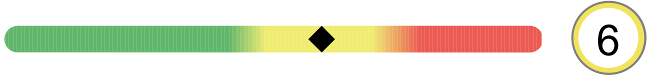
- 🔵 CoQ10 is a powerful antioxidant that is synthesized in the body and contained in cell membranes. CoQ10 is also essential for energy production & pH regulation.
- 🟢 CoQ10 deficiency may occur with HMG-CoA reductase inhibitors (statins), several anti-diabetic medication classes (biguanides, sulfonylureas) 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.

Plant-based Antioxidants



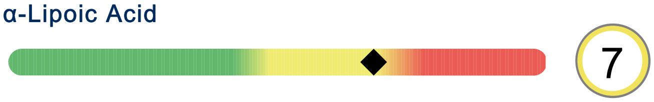
- 🔵 Oxidative stress is the imbalance between the production of free radicals and the body's ability to readily detoxify these reactive species and/or repair the resulting damage with anti-oxidants.
- 🟢 Oxidative stress can be endogenous (energy production and inflammation) or exogenous (exercise, exposure 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.).

Vitamin C



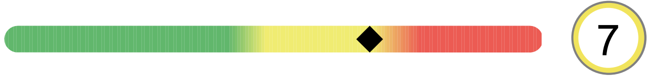
- 🔵 Vitamin C is an antioxidant (also used in the regeneration of other antioxidants). It is involved in cholesterol metabolism, the production & function of WBCs and antibodies, and the synthesis of collagen, norepinephrine and carnitine.
- 🟢 Deficiency may occur with oral contraceptives, aspirin, diuretics 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.

α-Lipoic Acid



- 🔵 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.

Glutathione



- 🔵 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.

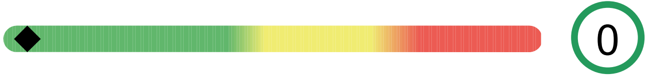
KEY

🔵 Function of Nutrient 🟢 Cause of Deficiency 🟣 Complications of Deficiency 🔴 Food Sources of Nutrient

Interpretation At-A-Glance

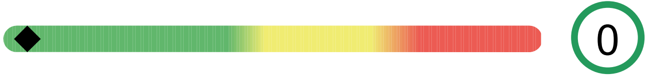
B-Vitamin Needs

Thiamin - B1



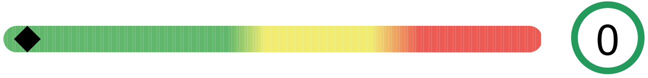
- 🔵 B1 is a required cofactor for enzymes involved in energy production from food, and for the synthesis of ATP, GTP, DNA, RNA and NADPH.
- 🟢 Low B1 can result from chronic alcoholism, diuretics, digoxin, oral contraceptives and HRT, or large amounts of tea & coffee (contain anti-B1 factors).
- 🟣 B1 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



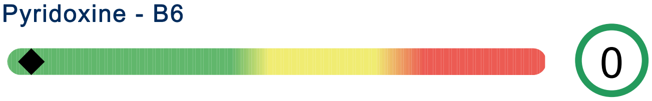
- 🔵 B2 is a key component of enzymes involved in antioxidant function, energy production, detoxification, methionine metabolism and vitamin activation.
- 🟢 Low B2 may result from chronic alcoholism, some anti-psychotic medications, oral contraceptives, tricyclic antidepressants, quinacrine or adriamycin.
- 🟣 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



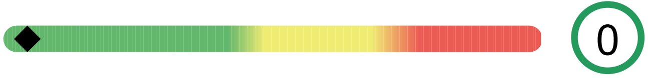
- 🔵 B3 is used to form NAD and NADP, involved in energy production from food, fatty acid & cholesterol synthesis, cell signaling, DNA repair & cell differentiation.
- 🟢 Low B3 may result from deficiencies of tryptophan (B3 precursor), B6, B2 or Fe (cofactors in B3 production), or from long-term isoniazid 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



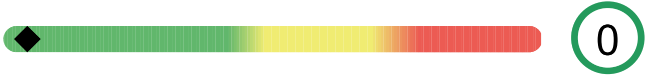
- 🔵 B6 (as P5P) is a cofactor for enzymes involved in glycogenolysis & gluconeogenesis, and synthesis of neurotransmitters, heme, B3, RBCs and nucleic acids.
- 🟢 Low B6 may result from chronic alcoholism, long-term diuretics, estrogens (oral contraceptives and HRT), anti-TB meds, penicillamine, L-DOPA 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



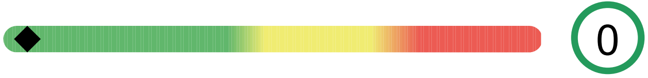
- 🔵 Biotin is a cofactor for enzymes involved in functions such as fatty acid synthesis, mitochondrial FA oxidation, gluconeogenesis and DNA replication & transcription.
- 🟢 Deficiency may result from certain inborn errors, chronic intake of raw egg whites, long-term TPN, anticonvulsants, high-dose B5, 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



- 🔵 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



- 🔵 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

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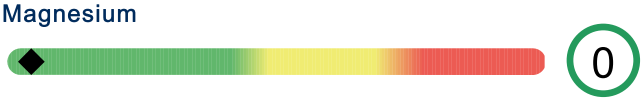
Interpretation At-A-Glance

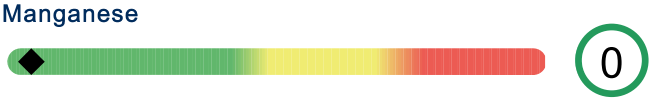
Mineral Needs

Magnesium



- 🔵 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

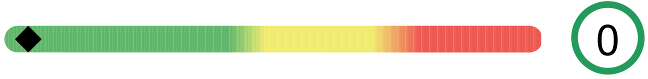


- 🔵 Manganese plays an important role in antioxidant function, gluconeogenesis, the urea cycle, cartilage & bone formation, energy production and digestion.
- 🟢 Impaired absorption of Mn may occur with excess intake of Fe, Ca, Cu, folic acid, or phosphorous compounds, or use of long-term TPN, Mg-containing 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

- 🔵 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).

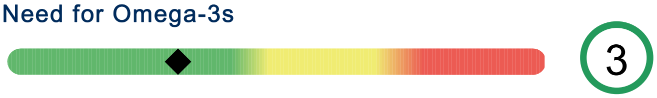
Zinc



- 🔵 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



- 🔵 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.

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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

4

- ● 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

4

- ● 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

3

- ● 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.

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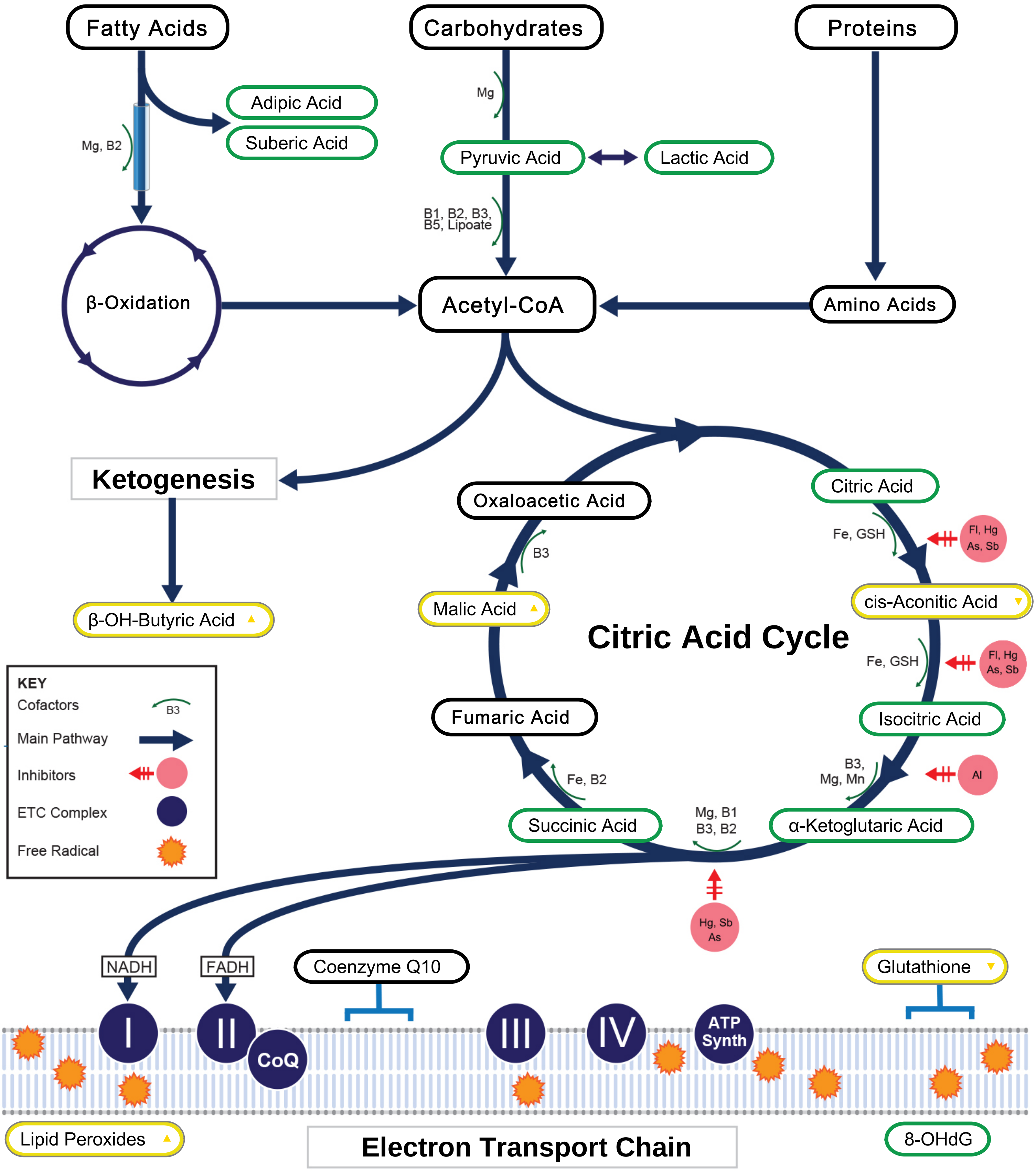
Oxidative Stress & Mitochondrial Dysfunction



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

Organic Acids (FMV Urine)

Malabsorption & Dysbiosis Markers

Malabsorption Markers

		Reference Range
Indoleacetic Acid	1.4	<= 4.2
Phenylacetic Acid	0.06	<= 0.12

Dysbiosis Markers

Dihydroxyphenylpropionic Acid (DHPPA)	1.4	<= 5.3
3-Hydroxyphenylacetic Acid	2.8	<= 8.1
4-Hydroxyphenylacetic Acid	7	<= 29
Benzoic Acid	0.05	<= 0.05
Hippuric Acid	<dl	<= 603

Yeast / Fungal Dysbiosis Markers

D-Arabinitol	15	<= 36
Citramalic Acid	2.0	<= 5.8
Tartaric Acid	39	<= 15

Vitamin Markers

Branched-Chain Catabolites (B1, B2, B3, ALA)

		Reference Range
α-Ketoadipic Acid	0.5	<= 1.7
α-Ketoisovaleric Acid	0.50	<= 0.97
α-Ketoisocaproic Acid	0.29	<= 0.89
α-Keto-β-Methylvaleric Acid	0.9	<= 2.1
Glutaric Acid	0.20	<= 0.51
Isovalerylglycine	1.1	<= 3.7

Methylation Markers (Folate, B12)

Formiminoglutamic Acid (FIGlu)	0.5	<= 1.5
Methylmalonic Acid	0.6	<= 1.9

Biotin Markers

3-Hydroxypropionic Acid	11	5-22
3-Hydroxyisovaleric Acid	8	<= 29

Cellular Energy & Mitochondrial Markers

Fatty Acid Metabolism

		Reference Range
Adipic Acid	0.9	<= 2.8
Suberic Acid	0.7	<= 2.1

Carbohydrate Metabolism

Pyruvic Acid	14	7-32
Lactic Acid	5.6	1.9-19.8
α-Hydroxybutyric Acid	0.91	<= 0.83
β-OH-Butyric Acid	1.7	<= 2.8
β-OH-β-Methylglutaric Acid	5	<= 15

Energy Metabolism

Citric Acid	137	40-520
cis-Aconitic Acid	13	10-36
Isocitric Acid	32	22-65
α-Ketoglutaric Acid	15	4-52
Succinic Acid	1.5	0.4-4.6
Malic Acid	1.5	<= 3.0

Methodology: GCMS, LC/MS/MS, Alkaline Picrate, Colorimetric

Neurotransmitter Metabolites

Kynurenine Markers (Vitamin B6)

		Reference Range
Kynurenic Acid	2.9	<= 7.1
Quinolinic Acid	5.3	<= 9.1
Kynurenic / Quinolinic Ratio	0.55	>= 0.44
Xanthurenic Acid	0.49	<= 0.96

Catecholamine Markers

Homovanillic Acid	2.3	1.2-5.3
Vanilmandelic Acid	1.8	0.4-3.6
3-Methyl-4-OH-phenylglycol	0.13	0.02-0.22

Serotonin Markers

5-OH-indoleacetic Acid	7.5	3.8-12.1

Toxin & Detoxification Markers

		Reference Range
Pyroglutamic Acid	23	16-34
α-Ketophenylacetic Acid (from Styrene)	0.14	<= 0.46
α-Hydroxyisobutyric Acid (from MTBE)	3.7	<= 6.7
Orotic Acid	0.63	0.33-1.01

Organic Acid Reference Ranges are Age Specific

Methodology: Colorimetric, thiobarbituric acid reactive substances (TBARS), Alkaline Picrate, Hexokinase/G-6-PDH, HPLC, GC/MS

Organic Acids (FMV Urine)

Oxalate Markers

Oxalate Markers		Reference Range
Glyceric Acid	9.9	3.5-16.4
Glycolic Acid	29	<= 67
Oxalic Acid	31	<= 78

All biomarkers reported in mmol/mol creatinine.

Creatinine Concentration

Creatinine Concentration		Reference Range
Urine Creatinine ◆	10.9	3.1-19.5 mmol/L

Oxidative Stress Markers

Antioxidants

Antioxidants		Reference Range
Glutathione (whole blood)	796	>= 669 micromol/L
Coenzyme Q10, Ubiquinone (serum)		mcg/mL

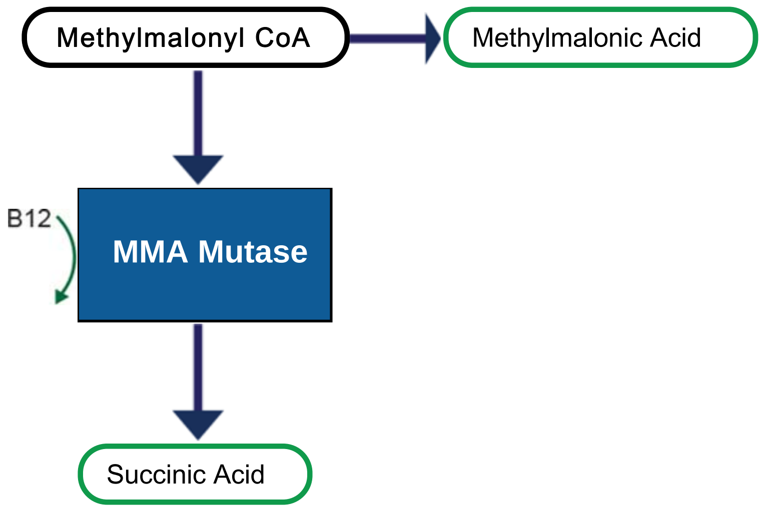
Oxidative Damage

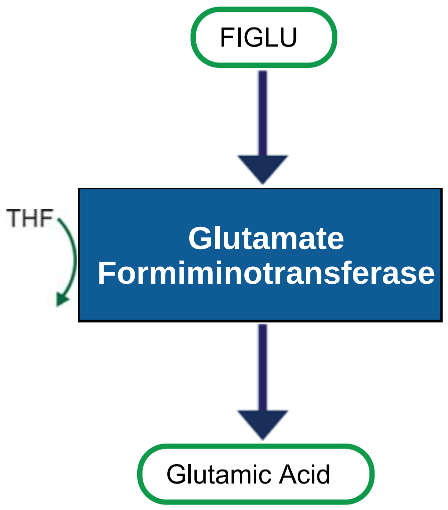
Oxidative Damage		Reference Range
Lipid Peroxides (urine)	7.2	<= 10.0 micromol/g Creat.
8-OHdG (urine)	6	<= 15 mcg/g Creat.

The Oxidative Stress reference ranges are based on an adult population.

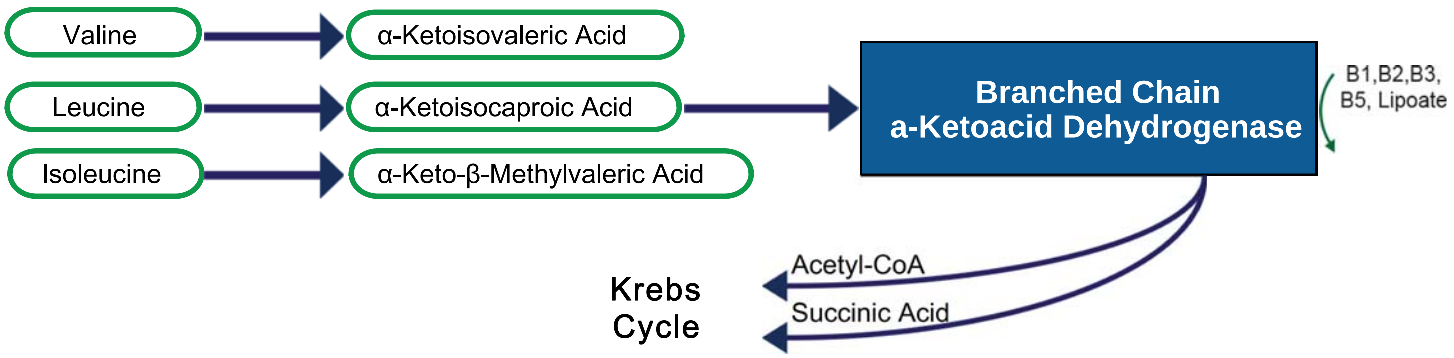
Pathways

Methylation Markers





Branched-Chain Amino Acid Metabolism



All biomarkers reported in micromoles per deciliter unless stated otherwise.

Amino Acids (Plasma)

Nutritionally Essential Amino Acids

Amino Acid		Reference Range
Arginine	12.8	4.1-17.5
Histidine	8.8	6.5-13.3
Isoleucine	8.23	4.09-17.43
Leucine	15.9	9.0-25.3
Lysine	28.1	13.7-34.7
Methionine	4.8	2.3-6.5
Phenylalanine	8.76	6.07-17.46
Taurine	5.15	4.41-10.99
Threonine	14.51	6.42-16.32
Tryptophan	5.01	2.65-6.67
Valine	27.2	18.3-42.6

Nonessential Protein Amino Acids

Amino Acid		Reference Range
Alanine	37	19-62
Asparagine	6.9	3.5-11.6
Aspartic Acid	<dl	<= 0.67
Cyst(e)ine	9.9	5.9-19.9
γ-Aminobutyric Acid	0.03	<= 0.06
Glutamic Acid	9.3	2.0-14.5
Glutamine	51	41-111
Proline	25	11-57
Tyrosine	11.7	4.8-17.3

Amino Acid reference ranges are age specific.

Methodology: LC/MS/MS

Intermediary Metabolites

B-Vitamin Markers		Reference Range
α-Aminoadipic Acid	0.09	<= 0.28
α-Amino-N-butyric Acid	8.62	1.76-9.99
β-Aminoisobutyric Acid	0.66	<= 0.72
Cystathionine	0.04	<= 0.09

Urea Cycle Markers

Citrulline	3.0	1.6-5.7
Ornithine	4.58	4.38-15.42
Urea	484	216-1,156

Glycine/Serine Metabolites

Glycine	7	5-23
Serine	5.5	2.1-7.0
Ethanolamine	0.44	0.19-0.78
Phosphoethanolamine	0.21	0.09-0.57
Phosphoserine	<dl	<= 0.39
Sarcosine	0.11	<= 0.15

Dietary Peptide Related Markers

		Reference Range
1-Methylhistidine	0.64	<= 3.85
3-Methylhistidine	0.49	<= 0.78
β-Alanine	0.4	<= 0.7

Methodology: GCMS

Essential & Metabolic Fatty Acids (RBCs)

Omega-3 Fatty Acids

(cold water fish, flax, walnut)

Analyte		Reference Range
α-Linolenic (ALA) 18:3 n3	0.17	>= 0.09 wt %
Eicosapentaenoic (EPA) 20:5 n3	0.76	>= 0.16 wt %
Docosapentaenoic (DPA) 22:5 n3	1.49	>= 1.14 wt %
Docosahexaenoic (DHA) 22:6 n3	4.6	>= 2.1 wt %
% Omega-3s	7.1	>= 3.8

Omega-9 Fatty Acids

(olive oil)

Analyte		Reference Range
Oleic 18:1 n9	13	10-13 wt %
Nervonic 24:1 n9	3.5	2.1-3.5 wt %
% Omega-9s	16.4	13.3-16.6

Saturated Fatty Acids

(meat, dairy, coconuts, palm oils)

Analyte		Reference Range
Palmitic C16:0	19	18-23 wt %
Stearic C18:0	16	14-17 wt %
Arachidic C20:0	0.25	0.22-0.35 wt %
Behenic C22:0	1.01	0.92-1.68 wt %
Tricosanoic C23:0	0.19	0.12-0.18 wt %
Lignoceric C24:0	2.5	2.1-3.8 wt %
Pentadecanoic C15:0	0.08	0.07-0.15 wt %
Margaric C17:0	0.31	0.22-0.37 wt %
% Saturated Fats	38.5	39.8-43.6

Omega-6 Fatty Acids

(vegetable oil, grains, most meats, dairy)

Analyte		Reference Range
Linoleic (LA) 18:2 n6	16.5	10.5-16.9 wt %
γ-Linolenic (GLA) 18:3 n6	0.08	0.03-0.13 wt %
Dihomo-γ-linolenic (DGLA) 20:3 n6	1.23	>= 1.19 wt %
Arachidonic (AA) 20:4 n6	16	15-21 wt %
Docosatetraenoic (DTA) 22:4 n6	1.66	1.50-4.20 wt %
Eicosadienoic 20:2 n6	0.37	<= 0.26 wt %
% Omega-6s	36.1	30.5-39.7

Monounsaturated Fatty Acids

Omega-7 Fatty Acids		Reference Range
Palmitoleic 16:1 n7	0.41	<= 0.64 wt %
Vaccenic 18:1 n7	1.31	<= 1.13 wt %

Trans Fats		
Elaidic 18:1 n9t	0.25	<= 0.59 wt %

Delta-6-Desaturase Activity

Upregulated Functional Impaired

Linoleic / DGLA 18:2 n6 / 20:3 n6	13.5	6.0-12.3

Cardiovascular Risk

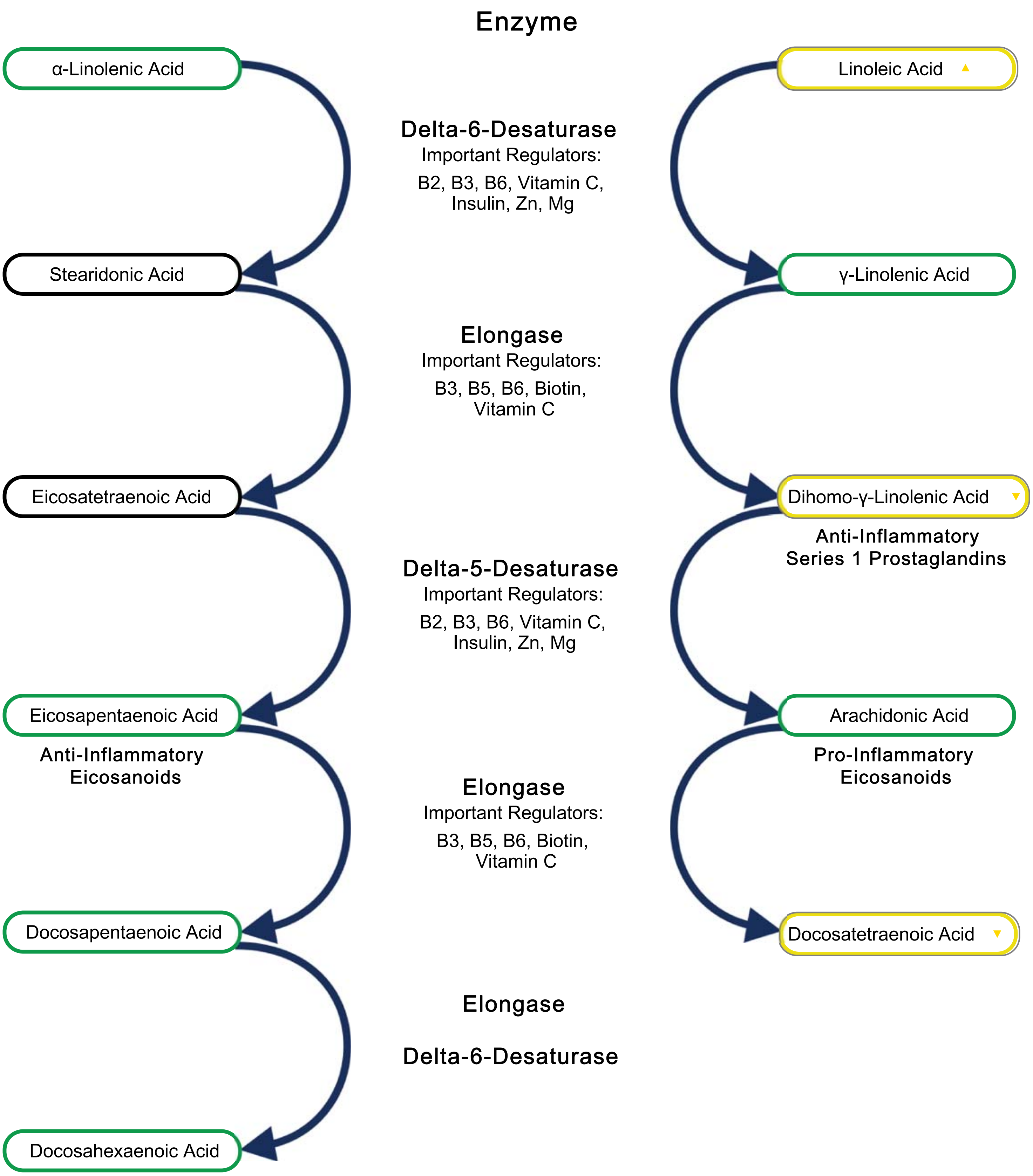
Analyte		Reference Range
Omega-6s / Omega-3s	5.1	3.4-10.7
AA / EPA 20:4 n6 / 20:5 n3	21	12-125
Omega-3 Index	5.4	>= 4.0

The Essential Fatty Acid reference ranges are based on an adult population.

Fatty Acid Metabolism

Omega-3 Metabolism

Omega-6 Metabolism



Enzyme

α-Linolenic Acid

Stearidonic Acid

Eicosatetraenoic Acid

Eicosapentaenoic Acid

Anti-Inflammatory Eicosanoids

Docosapentaenoic Acid

Docosahexaenoic Acid

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

Linoleic Acid ▲

γ-Linolenic Acid

Dihomo-γ-Linolenic Acid ▼

Anti-Inflammatory Series 1 Prostaglandins

Arachidonic Acid

Pro-Inflammatory Eicosanoids

Docosatetraenoic Acid ▼

Methodology: ICP-MS

Elemental Markers

Nutrient Elements

Element		Reference Range
Copper *(plasma)*	148.5	75.3-192.0 mcg/dL
Magnesium *(RBC)*	43.3	30.1-56.5 mcg/g
Manganese *(whole blood)*	11.1	3.0-16.5 mcg/L
Potassium *(RBC)*	2,231	2,220-3,626 mcg/g
Selenium *(whole blood)*	169	109-330 mcg/L
Zinc *(plasma)*	102.6	64.3-159.4 mcg/dL

Toxic Elements*

Element		Reference Range
Lead	0.72	<= 2.81 mcg/dL
Mercury	<DL	<= 4.35 mcg/L
Arsenic	1.5	<= 13.7 mcg/L
Cadmium	0.90	<= 1.22 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

The Elemental reference ranges are based on an adult population.

Commentary

Lab Comments
CoQ10 will not be reported due to an unknown interference. 11/28/2024
ks

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

The performance characteristics of all assays have been verified by Genova Diagnostics, Inc. Unless otherwise noted with ♦ the assay has not been cleared by the U.S. Food and Drug Administration.

The **Reference Range** is a statistical interval representing 95% or 2 Standard Deviations (2 S.D.) of the reference range population. One Standard Deviation (1 S.D.) is a statistical interval representing ~68% of the reference population. Values between 1 and 2 S.D. are not necessarily abnormal. Clinical Correlation is suggested.