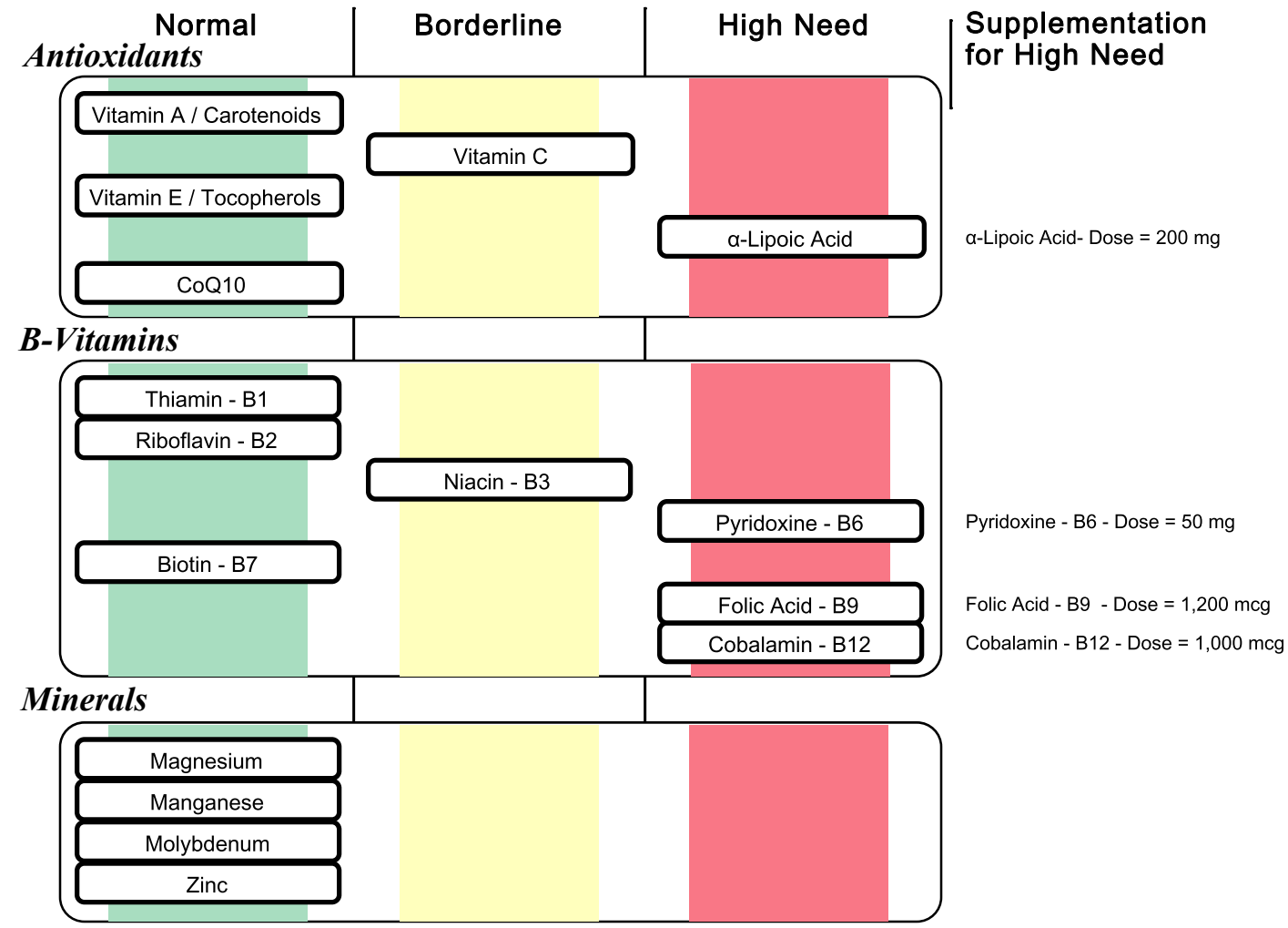
GENOVA DIAGNOSTICS
63 Zillicoa Street
Asheville, NC 28801

NutrEval™ Plasma amino acids

Patient:

DOB:
Sex:
MRN:

NutrEval Results Overview



SUGGESTED SUPPLEMENT SCHEDULE

Supplements	Daily Recommended Intake (DRI)	Patient's Daily Recommendations	Provider Daily Recommendations
Antioxidants			
Vitamin A / Carotenoids	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	
B-Vitamins			
Thiamin - B1	1.1 mg	10 mg	
Riboflavin - B2	1.1 mg	10 mg	
Niacin - B3	14 mg	30 mg	
Pyridoxine - B6	1.5 mg	50 mg	
Biotin - B7	30 mcg	100 mcg	
Folic Acid - 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 Oils	500 mg	1,000 mg	
Digestive Support			
Probiotics		10 billion CFU	
Pancreatic Enzymes		0 IU	
Other Vitamins			
Vitamin D	600 IU	Not ordered	

Amino Acid	mg/day	Amino Acid	mg/day
Arginine	46	Methionine	0
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		

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 Suggested Supplemental Schedule 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.

Key Normal Borderline High Need

NutrEval® Plasma amino acids

Interpretation At-A-Glance

Nutritional Needs

Antioxidants

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.

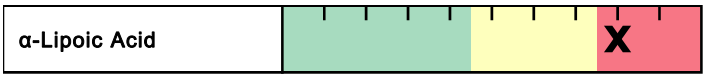
Vitamin C

- 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.

Vitamin E / Tocopherols

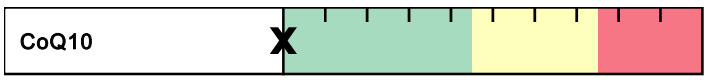
- Alpha-tocopherol (body's main form of vitamin E) functions as an antioxidant, regulates cell signaling, influences immune function and inhibits coagulation.
- Deficiency may occur with malabsorption, cholestyramine, colestipol, isoniazid, orlistat, olestra and certain anti-convulsants (e.g., phenobarbital,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

α-Lipoic Acid



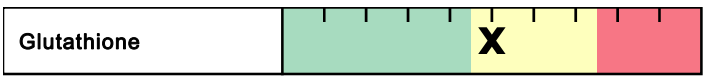
- α-Lipoic acid plays an important role in energy production, antioxidant activity (including the regeneration of vitamin C and glutathione), insulin signaling, cell signaling and the catabolism of α-keto acids and amino acids.
- High biotin intake can compete with lipoic acid for cell membrane entry.
- 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.

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.

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.

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.).

Key

- Function
- Causes of Deficiency
- Complications of Deficiency
- Food Sources

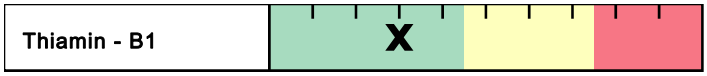
NutrEval Plasma amino acids

Interpretation At-A-Glance

Nutritional Needs

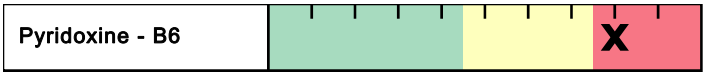
B-Vitamins

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.

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.

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.

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.

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.

Folic Acid - B9

- Folic acid 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.

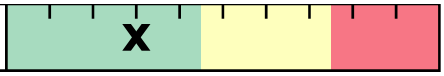
NutrEval® Plasma amino acids

Interpretation At-A-Glance

Nutritional Needs

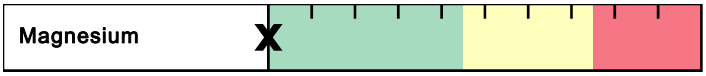
Minerals

Manganese



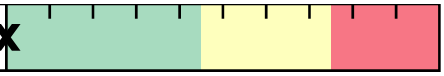
- Manganese plays an important role in antioxidant function, gluconeogenesis, the urea cycle, cartilage & bone formation, energy production and digestion.
- Impaired absorption of Mn may occur with excess intake of Fe, Ca, Cu, folic acid, or phosphorous compounds, or use of long-term TPN, Mg-containing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

Magnesium



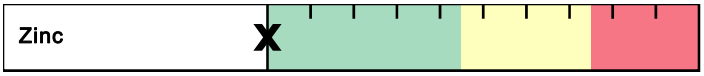
- Magnesium is involved in >300 metabolic reactions. Key areas include energy production, bone & ATP formation, muscle & nerve conduction and cell signaling.
- Deficiency may occur with malabsorption, alcoholism, hyperparathyroidism, renal disorders (wasting), diabetes, diuretics, digoxin or high doses 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.

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).

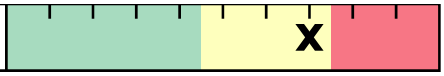
Zinc



- 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 Acids

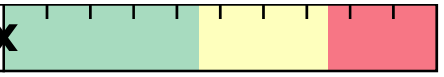
Need for Essential Fatty Acids



- 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.

Digestive Support

Need for Probiotics



- 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.

Need for Pancreatic Enzymes

- 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.

NutrEval® Plasma amino acids

Interpretation At-A-Glance

Functional Imbalances

Mitochondrial Dysfunction

- 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.

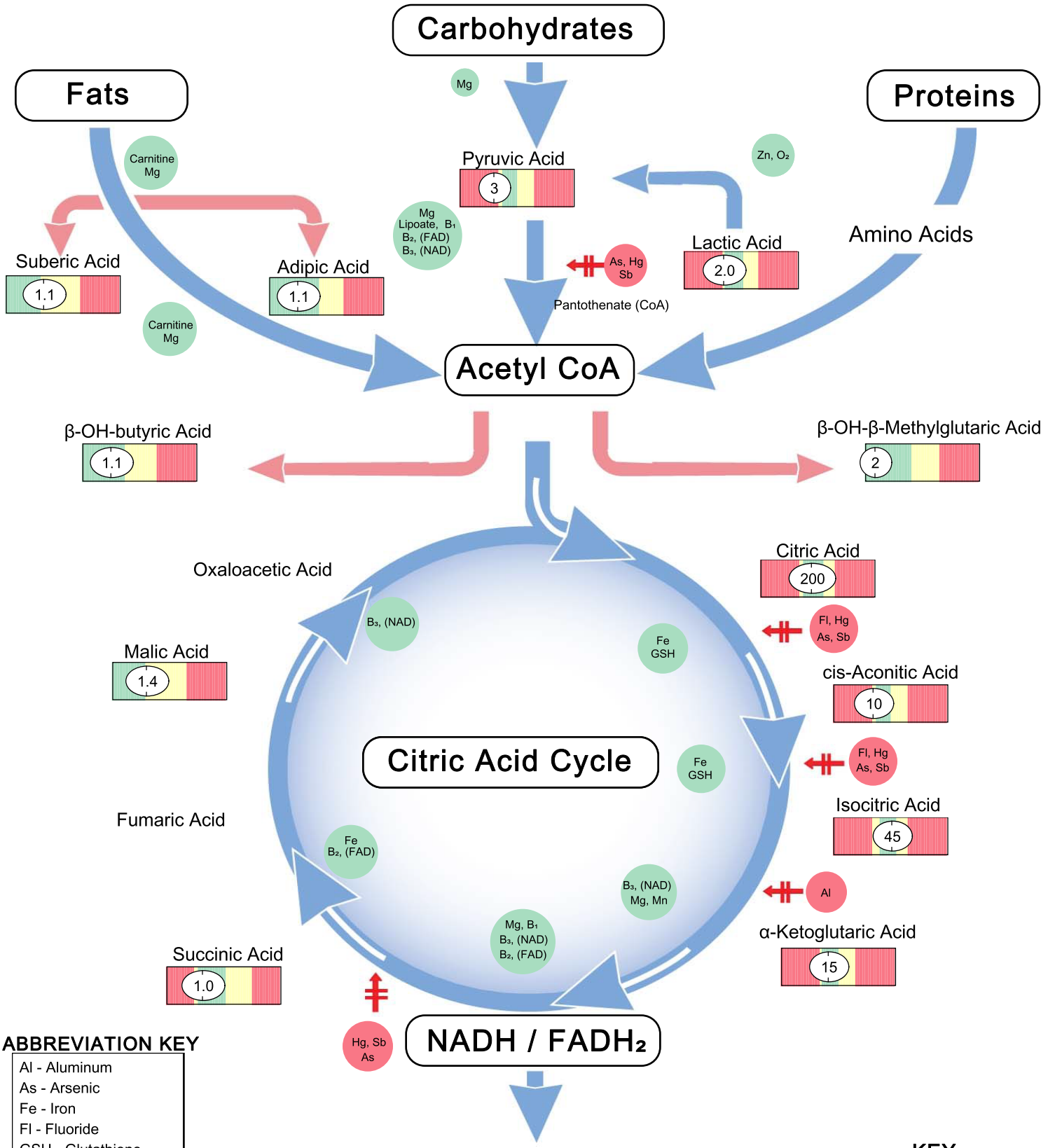
Toxic Exposure

- 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.

Need for Methylation

- 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.

Krebs Cycle At-A-Glance



ABBREVIATION KEY

Al - Aluminum
As - Arsenic
Fe - Iron
Fl - Fluoride
GSH - Glutathione
Hg - Mercury
Mg - Magnesium
Mn - Manganese
Sb - Antimony
Zn - Zinc

Electron Transport and Oxidative Phosphorylation

(2) H + 1/2 O_2 → H_2O

KEY

Green = cofactor

Red = inhibitor

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

Metabolic Analysis Markers (Urine)

Malabsorption and Dysbiosis Markers

Malabsorption Markers

		Reference Range
Indoleacetic Acid (IAA)	1.1	<= 4.2
Phenylacetic Acid (PAA)	0.06	<= 0.12

Bacterial Dysbiosis Markers

		Reference Range
Dihydroxyphenylpropionic Acid (DHPPA)	2.5	<= 5.3
3-Hydroxyphenylacetic Acid	5.0	<= 8.1
4-Hydroxyphenylacetic Acid	10	<= 29
Benzoic Acid	0.02	<= 0.05
Hippuric Acid	360	<= 603

Yeast / Fungal Dysbiosis Markers

		Reference Range
Arabinose	35	<= 96
Citramalic Acid	3.1	<= 5.8
Tartaric Acid	<dl	<= 15

Cellular Energy & Mitochondrial Metabolites

Carbohydrate Metabolism

		Reference Range
Lactic Acid	2.0	1.9-19.8
Pyruvic Acid	3	7-32
β-OH-Butyric Acid (BHBA)	1.1	<= 2.8

Energy Metabolism

		Reference Range
Citric Acid	200	40-520
Cis-Aconitic Acid	10	10-36
Isocitric Acid	45	22-65
α-Ketoglutaric Acid (AKG)	15	4-52
Succinic Acid	1.0	0.4-4.6
Malic Acid	1.4	<= 3.0
β-OH-β-Methylglutaric Acid (HMG)	2	<= 15

Fatty Acid Metabolism

		Reference Range
Adipic Acid	1.1	<= 2.8
Suberic Acid	1.1	<= 2.1

Creatinine Concentration

		Reference Range
Creatinine ◆	8.0	3.1-19.5 mmol/L

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

Neurotransmitter Metabolites

		Reference Range
Vanilmandelic Acid	1.5	0.4-3.6
Homovanillic Acid	2.6	1.2-5.3
5-OH-indoleacetic Acid	9.9	3.8-12.1
3-Methyl-4-OH-phenylglycol	0.07	0.02-0.22
Kynurenic Acid	6.6	<= 7.1
Quinolinic Acid	1.8	<= 9.1
Kynurenic / Quinolinic Ratio	3.67	>= 0.44

Vitamin Markers

		Reference Range
α-Ketoadipic Acid	0.6	<= 1.7
α-Ketoisovaleric Acid	0.23	<= 0.97
α-Ketoisocaproic Acid	0.18	<= 0.89
α-Keto-β-Methylvaleric Acid	0.7	<= 2.1
Formiminoglutamic Acid (FIGlu)	1.6	<= 1.5
Glutaric Acid	0.25	<= 0.51
Isovalerylglycine	3.5	<= 3.7
Methylmalonic Acid	0.8	<= 1.9
Xanthurenic Acid	0.83	<= 0.96
3-Hydroxypropionic Acid	7	5-22
3-Hydroxyisovaleric Acid	3	<= 29

Toxin & Detoxification Markers

		Reference Range
α-Ketophenylacetic Acid (from Styrene)	0.19	<= 0.46
α-Hydroxyisobutyric Acid (from MTBE)	3.9	<= 6.7
Orotic Acid	0.62	0.33-1.01
Pyroglutamic Acid	29	16-34

Tyrosine Metabolism

		Reference Range
Homogentisic Acid	9	<= 19
2-Hydroxyphenylacetic Acid	0.64	<= 0.76

Metabolic Analysis Reference Ranges are Age Specific

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.

Amino Acids (Plasma)

All biomarkers reported in micromoles per deciliter unless stated otherwise.

Nutritionally Essential Amino Acids

Amino Acid		Reference Range
Arginine	7.5	6.0-17.5
Histidine	9.1	6.5-13.3
Isoleucine	9.43	5.79-18.69
Leucine	18.8	12.1-36.1
Lysine	23.3	13.7-34.7
Methionine	4.5	2.3-6.5
Phenylalanine	9.39	6.07-17.46
Taurine	5.85	4.41-10.99
Threonine	15.22	6.42-16.32
Tryptophan	5.66	2.65-6.67
Valine	32.9	18.3-42.6

Nonessential Protein Amino Acids

Amino Acid		Reference Range
Alanine	28	23-62
Asparagine	8.3	3.5-11.6
Aspartic Acid	<dl	<= 0.67
Cyst(e)ine	9.3	5.9-19.9
γ-Aminobutyric Acid	<dl	<= 0.06
Glutamic Acid	3.1	2.0-14.5
Glutamine	64	44-111
Proline	32	15-57
Tyrosine	9.8	6.2-18.5

Intermediary Metabolites

B Vitamin Markers		Reference Range
α-Aminoadipic Acid	0.06	<= 0.28
α-Amino-N-butyric Acid	5.40	1.76-9.99
β-Aminoisobutyric Acid	0.40	<= 0.72
Cystathionine	0.27	<= 0.09
3-Methylhistidine	0.25	<= 0.78

Urea Cycle Markers		
Citrulline	4.2	1.6-5.7
Ornithine	9.41	4.38-15.42
Urea	535	216-1,156

Glycine/Serine Metabolites		
Glycine	12	5-23
Serine	5.5	2.1-7.0
Ethanolamine	0.55	0.19-0.78
Phosphoethanolamine	0.19	0.15-0.64
Phosphoserine	<dl	<= 0.39
Sarcosine	0.10	<= 0.15

Dietary Peptide Related Markers

		Reference Range
1-Methylhistidine	0.19	<= 1.64
β-Alanine	0.3	<= 0.7

Methodology: LC/MS/MS

Amino Acid Reference Ranges are age specific.

The performance characteristics of all assays have been verified by Genova Diagnostics, Inc. Assays have not been cleared by the U.S. Food and Drug Administration.

Essential and Metabolic Fatty Acids Markers (RBCs)

Omega 3 Fatty Acids

Analyte	(cold water fish, flax, walnut)	Reference Range
α-Linolenic (ALA) 18:3 n3	0.15	>= 0.09 wt %
Eicosapentaenoic (EPA) 20:5 n3	0.38	>= 0.16 wt %
Docosapentaenoic (DPA) 22:5 n3	1.69	>= 1.14 wt %
Docosahexaenoic (DHA) 22:6 n3	2.7	>= 2.1 wt %
% Omega 3s	4.9	>= 3.8

Omega 9 Fatty Acids

Analyte	(olive oil)	Reference Range
Oleic 18:1 n9	13	10-13 wt %
Nervonic 24:1 n9	2.8	2.1-3.5 wt %
% Omega 9s	15.8	13.3-16.6

Saturated Fatty Acids

Analyte	(meat, dairy, coconuts, palm oils)	Reference Range
Palmitic C16:0	20	18-23 wt %
Stearic C18:0	18	14-17 wt %
Arachidic C20:0	0.32	0.22-0.35 wt %
Behenic C22:0	0.86	0.92-1.68 wt %
Tricosanoic C23:0	0.18	0.12-0.18 wt %
Lignoceric C24:0	1.8	2.1-3.8 wt %
Pentadecanoic C15:0	0.13	0.07-0.15 wt %
Margaric C17:0	0.33	0.22-0.37 wt %
% Saturated Fats	41.3	39.8-43.6

Methodology: GCMS

Omega 6 Fatty Acids

Analyte	(vegetable oil, grains, most meats, dairy)	Reference Range
Linoleic (LA) 18:2 n6	14.9	10.5-16.9 wt %
γ-Linolenic (GLA) 18:3 n6	0.11	0.03-0.13 wt %
Dihomo-γ-linolenic (DGLA) 20:3 n6	0.82	>= 1.19 wt %
Arachidonic (AA) 20:4 n6	18	15-21 wt %
Docosatetraenoic (DTA) 22:4 n6	2.07	1.50-4.20 wt %
Eicosadienoic 20:2 n6	0.24	<= 0.26 wt %
% Omega 6s	36.4	30.5-39.7

Monounsaturated Fats

Omega 7 Fats		Reference Range
Palmitoleic 16:1 n7	0.29	<= 0.64 wt %
Vaccenic 18:1 n7	1.02	<= 1.13 wt %
Trans Fat		
Elaidic 18:1 n9t	0.34	<= 0.59 wt %

Delta - 6 Desaturase Activity

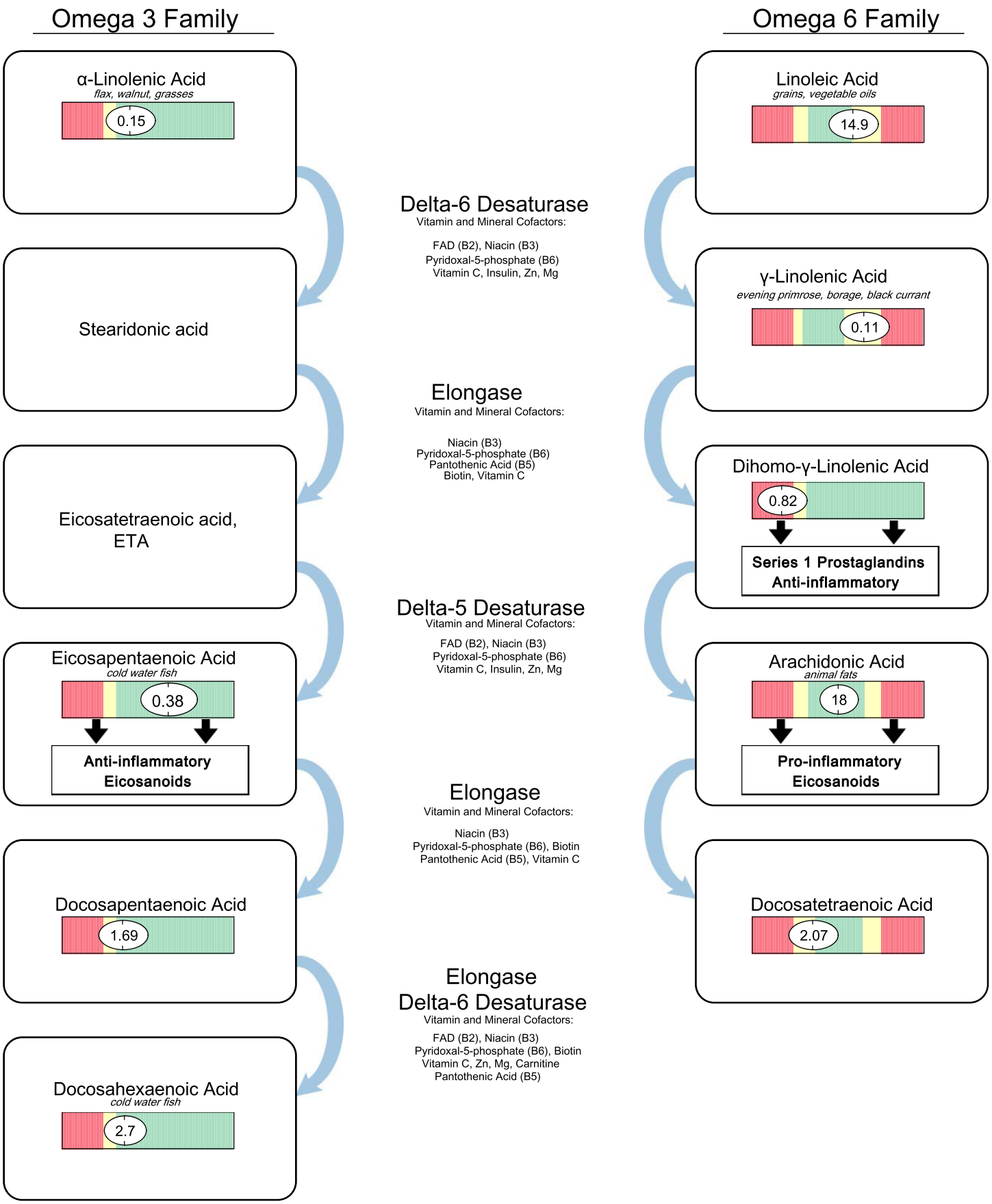
	Upregulated Functional Impaired	
Linoleic / DGLA 18:2 n6 / 20:3 n6	18.1	6.0-12.3

Cardiovascular Risk

Analyte		Reference Range
Omega 6s / Omega 3s	7.4	3.4-10.7
AA / EPA 20:4 n6 / 20:5 n3	48	12-125
Omega 3 Index	3.1	>= 4.0

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

Essential Fatty Acid Metabolism



This test was developed and its performance characteristics determined by Genova Diagnostics, Inc. It has not been cleared by the U.S. Food and Drug Administration.

Oxidative Stress Markers

Oxidative Stress Markers

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

	Reference Range
Glutathione (whole blood)	876 — >=669 micromol/L
Lipid Peroxides (urine)	7.0 — <=10.0 micromol/g Creat.
8-OHdG (urine)	6 — <=15 mcg/g Creat.
Coenzyme Q10, Ubiquinone (serum)	0.99 — 0.43-1.49 mcg/mL

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

The performance characteristics of the Oxidative Stress Markers have been verified by Genova Diagnostics, Inc. Unless otherwise noted with ◆ they have not been cleared by the U.S. Food and Drug Administration.

Elemental Markers

Nutrient Elements

Element	Reference Range	Reference Range
Copper *(plasma)*	99.2	75.3-192.0 mcg/dL
Magnesium *(RBC)*	45.9	30.1-56.5 mcg/g
Manganese *(whole blood)*	9.8	3.0-16.5 mcg/L
Potassium *(RBC)*	2,877	2,220-3,626 mcg/g
Selenium *(whole blood)*	175	109-330 mcg/L
Zinc *(plasma)*	83.7	64.3-159.4 mcg/dL

Toxic Elements*

Element	Reference Range	Reference Range
Lead	1.20	<= 2.81 mcg/dL
Mercury	0.58	<= 4.35 mcg/L
Arsenic	<DL	<= 13.7 mcg/L
Cadmium	0.18	<= 1.22 mcg/L
Tin	<DL	<= 0.39 mcg/L

* All toxic Elements are measured in whole blood.
Methodology: ICP-MS

The Elemental reference ranges are based on an adult population.
The performance characteristics of the Elemental Markers have been verified by Genova Diagnostics, Inc. They have not been cleared by the U.S. Food and Drug Administration.

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

CHECKLIST (PRIOR TO SHIPPING)

1. All Tubes
- ❑ **Patient's Date of Birth** written on all tube labels
- ❑ All the tubes are tightly closed

2. Blood Tubes - Frozen
- ❑ Amber transfer tube
- ❑ Yellow transfer tube

3. Blood Tubes - Refrigerated
- ❑ Na EDTA or K2-EDTA blue-top tube
- ❑ EDTA lavender-top tube

4. Urine Tubes - Frozen
- ❑ Green-top tube
- ❑ Blue-top Amber transfer tube

5. Swabs (ONLY FOR GENOMICS ADD-ONS)
- ❑ Swabs in the package and in the envelope

6. Test Requisition Form with Payment
- ❑ Test Requisition Form is complete **Test is marked, Patient's first and last name, date of birth, gender,** and **date of collection** are recorded
- ❑ Payment is included or pay online at **www.gdx.net/prc**

SHIP THE SPECIMEN(S) TO THE LAB

Specimen(s) must be returned in the Genova Diagnostics kit box.
Please refer to the shipping instruction insert found in your kit box.

GENOVA DIAGNOSTICS

Call 800.522.4762 or visit our website at www.gdx.net

NUTREVAL PLASMA SPECIMEN COLLECTION INSTRUCTIONS

CLINICIAN BLOOD DRAW INSTRUCTIONS

NutrEval® Plasma amino acids

The following test(s) can be collected using these instructions:

NutrEval® Plasma*	**#3001**

Add-ons available
- Vitamin D #3532
- Genomics a-la-carte SNPs
  - › ApoE #5112
  - › MTHFR #5111
  - › COMT #5102
  - › TNF-α #5106

** Not available in New York*

Test may not be processed without this information.

KIT LABEL SHEET

Write on each label
- ❑ **Patient's Date of Birth**

Attach and label:
- ❑ **ALL TUBES**
- ❑ **Front upper right hand corner of the Test Requisition**

TEST REQUISITION FORM

Please fill out:
- ❑ **Patient's First/Last name**
- ❑ **Date of Birth**
- ❑ **Gender**
- ❑ **Date of Collection**

Specimen

Blood, Plasma, Serum

Additional Materials

- Foam Insulator Box
- Freezer Brick
- Biohazard Bag with Absorbent Material
- Rubber Band
- Test Requisition Form
- Collection Labels
- Prepaid Mailing Envelope
- Bubblewrap Bag

Collection Materials for Blood

Na Heparin blue-top tube

EDTA lavender-top tube

Blue-top preservative tube

Yellow-top transfer tube

or

Na-EDTA blue-top tube

K2-EDTA blue-top tube

Amber transfer tube

SST red tiger-top tube

Pipette (3)

The Na-EDTA blue-top tube is interchangeable with the K2-EDTA blue-top tube for this specimen collection pack. Please Note: These are trace mineral tubes, not standard tubes.

IMPORTANT PREP BEFORE SAMPLE COLLECTIONS

- ❑ Schedule the patient accordingly
- ❑ Abnormal kidney function or use of diuretics may influence test results
- ❑ Female patients should not collect urine during a menstrual period

MEDICATIONS MAY IMPACT RESULTS

Discontinuation is at the discretion of the physician if medically appropriate Antibiotics, antifungals, amphetamines, acid blockers, fibrate and corticosteroids may impact results

4 DAYS BEFORE THE TEST:

- ❑ If medically appropriate, non-essential medications, supplements, and nutrient fortified foods/beverages should be discontinued
- ❑ Avoid artificial sweeteners and MSG

24 HOURS BEFORE THE TEST:

- ❑ Patient should eat their usual diet Avoid over-consuming any single food or extreme diets
- ❑ Fluid intake should be limited to eight 8-ounce glasses of fluid
- ❑ Patient should avoid seafood

NIGHT BEFORE THE TEST:

- ❑ Patients must fast overnight prior to the blood draw
- ❑ Freeze the enclosed freezer brick a minimum of 8 hours before shipping

THE DAY OF THE TEST:

- ❑ All patient's urine tubes must be completely frozen prior to blood draw appointment

For more details, please visit
www.gdx.net/tests/prep

BLOOD COLLECTION

Please collect all tubes in one session. Label each tube with the patient's date of birth.
Blood processing note: Step 3 must be completed within 45 minutes after blood collection.

1 Before venipuncture, thoroughly wash the skin area with isopropyl alcohol, using two successive swabs of clean, sterile cotton. **Do not use iodine or mercury-based disinfectants/antiseptics.** Extra cleaning of the skin is important for accurate trace element analysis. **Use only stainless steel needles, with no aluminum or other metal** crimp ring.

2 DRAW BLOOD

3 BLOOD PROCESSING

NA-EDTA or K2-EDTA BLUE-TOP TUBE

Gently invert the tube 10-15 times
Refrigerate no more than 4 days prior to shipping

RETURN TO LAB

NA HEPARIN BLUE-TOP TUBE

Gently invert the tube 10-15 times
Centrifuge 15 min. at 3000 RPM
Transfer plasma to blue-top preservative tube

DISCARD

BLUE-TOP PRESERVATIVE TUBE

Immediately shake very hard at least 10-20 sec.
Centrifuge for 5 min. at 2500 RPM
Transfer the clear supernatant into the yellow-top transfer tube

DISCARD

YELLOW-TOP TRANSFER TUBE:

Freeze

RETURN TO LAB

RED SST TIGER-TOP TUBE

Clot for 15 min. while standing in a rack
Centrifuge 15 min. at 3000 RPM
Transfer serum to amber transfer tube

DISCARD

AMBER TRANSFER TUBE

Freeze

RETURN TO LAB

EDTA LAVENDER TOP TUBE

Gently invert 5 times
Do Not Shake
Refrigerate

RETURN TO LAB

NUTREVAL PLASMA SPECIMEN COLLECTION INSTRUCTIONS

PATIENT URINE AND SALIVA COLLECTION INSTRUCTIONS

NutrEval® Plasma amino acids

The following test(s) can be collected using these instructions:

NutrEval® Plasma* **#3001**

Add-ons available

- Vitamin D #3532
- Genomics a-la-carte SNPs
  - › ApoE #5112
  - › MTHFR #5111
  - › COMT #5102
  - › TNF-α #5106

** Not available in New York*

Test may not be processed without this information.

KIT LABEL SHEET

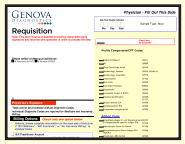
Write on each label

- ❑ **Patient's Date of Birth**

Attach and label:

- ❑ **ALL TUBES**
- ❑ **Front upper right hand corner of the Test Requisition**
- ❑ **Genomics envelope**

TEST REQUISITION FORM



Please fill out:

- ❑ **Patient's First/Last name**
- ❑ **Date of Birth**
- ❑ **Gender**
- ❑ **Date of Collection**

Specimen

Urine (per instructions), frozen

Saliva (only for Genomics add-ons)

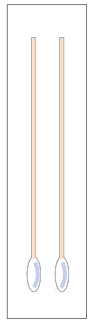
Collection Materials for Urine

Blue-top Amber Tube

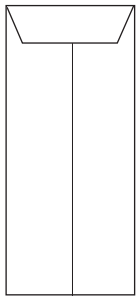
Green-top Urine Tube

Pipette

Collection Materials for Saliva



Cotton Swabs and Package



Envelope

GENOVA DIAGNOSTICS®

Call 800.522.4762 or visit our website at www.gdx.net

URINE COLLECTION

24 HOURS BEFORE THE TEST:

- ❑ **Eat usual diet,** but avoid over-consuming any single food or extreme diet
- ❑ **Fluid intakes** should be limited to eight 8-ounce glasses of fluid over a 24 hour period

NIGHT BEFORE THE TEST:

- ❑ **You must fast** overnight prior to your blood draw

MORNING OF COLLECTION:

- ❑ **Avoid** contact with the skin and eyes. For eye contact, flush with water thoroughly for 15 minutes. For skin contact, wash thoroughly with soap and water. If ingested, contact poison control center immediately.
- ❑ **Collect** and return specimen to your clinician on morning of blood draw
- ❑ **Females** should not collect urine during a menstrual period

IMPORTANT: To ensure accurate test results you MUST provide the requested information.

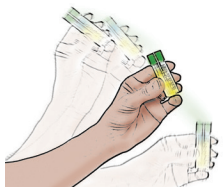
1. **Label all tubes with the patient's date of birth. Do not discard tube fluid.**

2. **Write patient's first and last name, date of birth, gender and date of collection** on the Test Requisition Form.

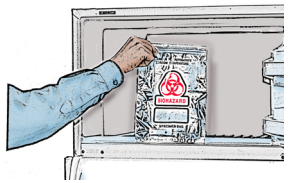
3. **Consider collecting urine 24 hours prior to blood collection to allow enough time for urine to freeze completely.**
   If you wake up to urinate during the night (within six hours of waking) **collect** that urine into a sterile collection container-or a clean, disposable container- and refrigerate it. Upon waking, **collect** your urine into the same container. Fill the container, and pass any additional urine into the toilet.

4. **Use** the pipette to transfer urine from the collection container into the Blue-top Amber Tube and Green-top Urine Tube until both are nearly full.

5. **Recap** the tubes tightly and **shake**.



6. **Place** the tubes into the biohazard bag labeled BAG ONE and **freeze** for a **minimum of 2 hours**. **Bring frozen urine to the blood draw. Some thawing in transit is expected.**



SALIVA COLLECTION (ONLY FOR GENOMICS ADD-ON TESTING)

NIGHT BEFORE COLLECTION:

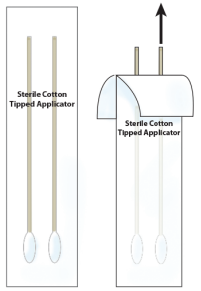
- ❑ **Use** your normal nightly routine of brushing and flossing of teeth, but do not use mouthwash

MORNING OF COLLECTION:

- ❑ Specimen must be **collected** immediately upon rising. **Do not practice** normal oral hygiene routine, do not eat or drink anything other than water.
- ❑ Just prior to collection, **wash** hands completely with hand soap

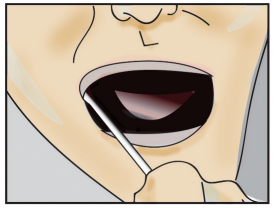
For full details refer to: **www.gdx.net/tests/prep**

1. **Keeping the packet intact, peel** open the package labeled, "Sterile Cotton Tipped Applicator." **Only peel back the package far enough to remove the cotton swab applicator.**

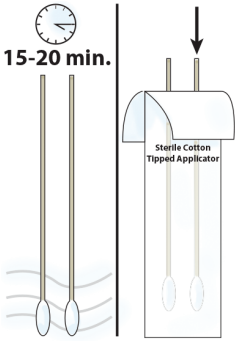


2. **Remove** one applicator.
   Avoid contact with the cotton tip.

3. **Open** your mouth widely and insert applicator. For at least 30 seconds, **aggressively scrape** the inside of your cheek using a back and forth, and up and down motion. **Rotate** the applicator several times, and **swab** between the cheek and gums. Avoid excessive saliva.
   Note: Follow these instructions carefully to ensure the swab collects a sufficient amount of cheek cells. If there is not enough DNA collected on the applicator, a recollection will be required.



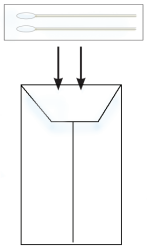
REPEAT FIGURES 2 - 3 WITH SECOND SWAB



4. **Allow** swabs to air dry for 15-20 minutes, then replace them (swab first) into the swab applicator package.

5. **Print** Full name, collection date, and date of birth on specimen collection label. **Place** the specimen collection label on the envelope.

6. **Insert** swab applicator package into the letter envelope and seal. Deliver the envelope, along with the frozen bag containing urine sample, to your healthcare provider's office.



Pediatrics* Minimums for NutrEval

NutrEval FMV amino acids

Blood Draw Tube	Volume of Blood Draw (mls)	Pediatric Minimum Draw Amounts (mls)	Processing?	Transfer Tube?	Biomarkers
Na EDTA	6	3	No	NA	Elemental
SST	8.5	3	Yes	Amber Transfer tube with Serum label	Vitamin D and CoQ10
EDTA	4	4	No	NA	Glutathione and EMFA

Urine Tubes are the same as current (SSA tube for amino acids; Thymol tube for OA; Neutral tube for 8OHdG)

NutrEval Plasma amino acids

Blood Draw Tube	Volume of Blood Draw (mls)	Pediatric Minimum Draw Amounts (mls)	Processing?	Transfer Tube?	Biomarkers
Na Heparin	6	6	Yes	Yellow Top Tube	Amino Acids (Plasma)
Na EDTA	6	3	No	NA	Elemental
SST	8.5	3	Yes	Amber Transfer tube with Serum label	Vitamin D and CoQ10
EDTA	4	4	No	NA	Glutathione and EMFA

Urine Tubes are the same as current (Thymol tube for OA; Neutral tube for 8OHdG)

* NutrEval FMV and NutrEval Plasma testing is not available for those less than 2 years of age. Specimens for patients less than 2 years of age will be discarded

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