NutrEval FMV 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.

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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.

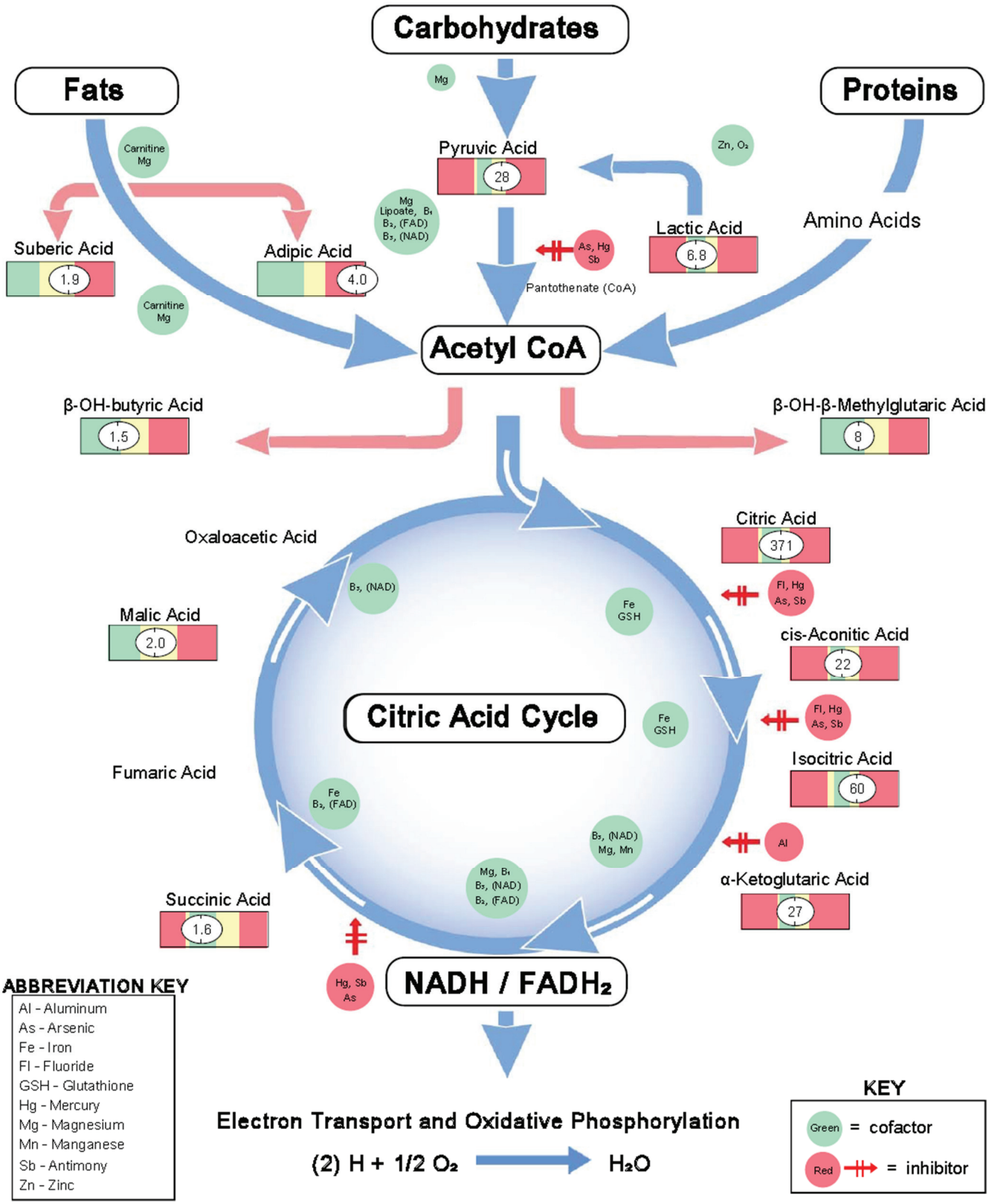
Need for Methylation

- 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.

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.

Krebs Cycle At-A-Glance



Metabolic Analysis Markers

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

Malabsorption and Dysbiosis Markers

Malabsorption Markers	Reference Range
Indoleacetic Acid (IAA)	<= 4.2
Phenylacetic Acid (PAA)	<= 0.12

Bacterial Dysbiosis Markers	Reference Range
Dihydroxyphenylpropionic Acid (DHPPA)	<= 5.3
3-Hydroxyphenylacetic Acid	<= 8.1
4-Hydroxyphenylacetic Acid	<= 29
Benzoic Acid	<= 0.05
Hippuric Acid	<= 603

Yeast / Fungal Dysbiosis Markers	Reference Range
Arabinose	<= 96
Citramalic Acid	<= 5.8
Tartaric Acid	<= 15

Cellular Energy & Mitochondrial Metabolites

Carbohydrate Metabolism	Reference Range
Lactic Acid	1.9-19.8
Pyruvic Acid	7-32
β-OH-Butyric Acid (BHBA)	<= 2.8

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

Fatty Acid Metabolism	Reference Range
Adipic Acid	<= 2.8
Suberic Acid	<= 2.1

Creatinine Concentration

	Reference Range
Creatinine ◆	3.1-19.5 mmol/L

Neurotransmitter Metabolites

	Reference Range
Vanilmandelic Acid	0.4-3.6
Homovanillic Acid	1.2-5.3
5-OH-Indoleacetic Acid	3.8-12.1
3-Methyl-4-OH-phenylglycol	0.02-0.22
Kynurenic Acid	<= 7.1
Quinolinic Acid	<= 9.1
Kynurenic / Quinolinic Ratio	>= 0.44

Vitamin Markers

	Reference Range
α-Ketoadipic Acid	<= 1.7
α-Ketoisovaleric Acid	<= 0.97
α-Ketoisocaproic Acid	<= 0.89
α-Keto-β-Methylvaleric Acid	<= 2.1
Formiminoglutamic Acid (FIGlu)	<= 1.5
Glutaric Acid	<= 0.51
Isovalerylglycine	<= 3.7
Methylmalonic Acid	<= 1.9
Xanthurenic Acid	<= 0.96
3-Hydroxypropionic Acid	5-22
3-Hydroxyisovaleric Acid	<= 29

Toxin & Detoxification Markers

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

Tyrosine Metabolism

	Reference Range
Homogentisic Acid	<= 19
2-Hydroxyphenylacetic Acid	<= 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.