Nutrient Descriptions

Acetyl-l-carnitine – Acetyl-L-carnitine (ALC) is similar to acetylcholine and functions as a neurotransmitter. It also serves as a source of carnitine which helps generate energy in heart muscle by transporting fatty acids into the mitochondria. ALC is used to treat AIDS, Alzheimer's Dz, cirrhosis, dementia, depression, diabetes erectile dysfunction, fibromyalgia, gastritis, facial paralysis, multiple sclerosis, opioid addiction and Peyronie's disease.

Alpha Lipoic acid – Alpha-lipoic acid (ALA) functions as a cofactor for certain mitochondrial enzymes, exhibits antioxidant activity as well as enhancing the regeneration of other antioxidants such as vitamins C and E and glutathione. ALA is synthesized by the human body but can also be found in small amounts in many foods. ALA has been found to be useful for preventing or treating *Amanita phalloides* mushroom poisoning, burning mouth syndrome, diabetes, hepatitis, myopathy, disorders of taste and vitiligo. It also can be used to chelate copper in patients with Wilson's disease.

Beta-sitosterol – Beta-sitosterol is part of a group of compounds with chemical structures similar to cholesterol. Beta-sitosterol will reduce prostatic hypertrophy and help lower LDL-Cholesterol levels. Foods high in phytosterols are peanuts, soy, olives, sesame, and pumpkin seeds.

Butyric acid – Butyric acid is also called butanoic acid which is a fatty acid ester found in animal fats and plant oil. It makes up about 4% of butter and contributed to the disagreeable odor when it turns rancid. Butyric acid is used as a supportive agent in the prevention and treatment of a variety of diseases such diarrhea, diverticulitis, colitis, and radiation induced inflammation. It is found in butter, cheeses, milk, yoghurts, cream, sauerkraut, and other fermented soy products.

Co Q 10 – also known as ubiquinone, Coenzyme Q 10 is a fat soluble that is largely synthesized in vivo and acts as a cofactor in the cellular electron-transport chain. CoQ10 has antioxidant properties, enhances immune function, and provides resistance against infection. It is used for a variety of conditions such as heart disease, hypertension, Parkinson's disease, migraines, Cerebellar ataxia, hearing loss, Muscular dystrophy, tinnitus, myopathy, infertility, myelodysplasia, and AIDS.

DHEA – Dehydroepiandrosterone is an androgenic hormone secreted by the adrenal glands and in smaller amounts by the testis and ovaries. DHEA and DHEA-S are precursor hormones and are metabolized to testosterone and estrogen and may serve an immune function. DHEA levels decline as we age and therefore are often provided as a supplement in older patients. DHEA has been used to treat autoimmune diseases, Crohn's disease, depression, dysthymia, erectile dysfunction, low adrenal function, menopause, motion sickness, osteoporosis, schizophrenia, systemic lupus erythematosus, female sexual dysfunction, ulcerative colitis and urticaria.

Diindolylmethane (DIM) - Diindolylmethane (DIM) is a metabolite of indole-3-carbinol a compound that is found in cruciferous vegetables such as cabbage, cauliflower, and broccoli. DIM is thought to be effective in the treatment of breast and prostate cancer. DIM supplements

have not been found to have serious side effects but may cause an increase in bowel movements, a darkening of urine headaches, and gas and bloating. Nausea and vomiting as well as skin rash are less common side effects.

5-Hydroxy tryptophan – 5-Hydroxy tryptophan (5-HTP) is a metabolite of L-tryptophan and a precursor to serotonin. It is useful in the prevention and treatment of cerebellar ataxia, depression, fibromyalgia, insomnia, migraines, and sleep terrors. 5-HTP is generally well tolerated but may cause some patients to develop nausea, diarrhea, abdominal pain, heartburn, myalgia, drowsiness, and headaches.

Lithium – Lithium is a mood stabilizing medicine used to treat mania (feeling highly excited, overactive, or distracted), depression, bipolar disorder and to reduce aggressive or self-harming behaviors. Because lithium has known toxic effects on the thyroid gland and kidneys, its use medically has decreased in favor of other medications.

Melatonin – Melatonin is a hormone that is synthesized from tryptophan in both the pineal gland and gastrointestinal tract. Its main function is in regulating the bodies circadian rhythms and enhancing sleep. It also will enhance immune function as well as protect retinal epithelium cells from oxidative damage. Melatonin secretion decline with age in individuals with age related morbidity or due to certain medications. Medical conditions affected by melatonin are age related macular degeneration, cancer, cluster headaches, hemicrania continua, headaches, insomnia, irritable bowel syndrome, migraines, non-ulcer dyspepsia, sarcoidosis, seasonal affective disorder, tardive dyskinesia, thrombocytopenia, and tinnitus.

N-Acetylcysteine – N-Acetylcysteine (NAC) is derived from the amino acid cysteine and is chemically more stable than cysteine. Cysteine is the precursor molecule for the antioxidant glutathione and acts as an antioxidant and free radical scavenger. NAC decreases the viscosity of mucus and thus is beneficial in the treatment of pulmonary fibrosis and chronic obstructive pulmonary disease (COPD) when administered through a nebulized. NAC is useful for acetaminophen overdose, akathisia, bipolar disorder, blepharitis, COPD, cocaine addiction, cystinuria, hyperhomocysteinemia, pulmonary fibrosis, influenza, obsessive-compulsive disorder, polycystic ovary syndrome, schizophrenia, scleroderma, and septic shock.

Phosphatidylserine – Phosphatidylserine is normally found in cell membranes and plays a role in cell-to-cell communication and neurotransmitter release. It is useful in the treatment of Alzheimer's disease, dementia and to enhance athletic performance.

Turmeric/curcumin – Turmeric and curcumin are often treated as being one in the same, but while curcumin is a component of turmeric, there is a significant difference clinically between them. Curcumin provides relief from muscle soreness after exercise and because of the helps to cut down on muscle injury. Additionally, it helps slow the aging process of muscle tissue. Curcumin also helps to prevent type 2 diabetes by improving insulin resistance which in turn lowers one's blood glucose and cholesterol levels. Additionally, more recent research shows that curcumin is an effective in the treatment of cancer.

Vitamin A – Carotenoids alpha, beta and gamma are converted to Vitamin A primarily in the intestines. Beta carotene is made up of 2 Vitamin A molecules that are linked but is not as biologically active as a single Vitamin A molecule. Only bout 1/3rd of Beta carotene is absorbed with about 2/3rds converted to Vitamin A. Vitamin A is needed for growth and development of skeletal and soft tissues through differentiation of basal cells into mucus epithelial cells. It is also needed for development of the rods and cones of the eye. Vitamin A maintains the integrity of the mucus membranes and thus has been termed the "anti-infective vitamin" as well as providing protection against the development of breast, lung, bladder skin and cervical cancers.

Vitamin B-12 / Cobalamin – Vitamin B12 is a group of cobalt containing molecules that are termed cobalamins. Methylcobalamin and 5-deoxyadenosylcobalamin are coenzyme forms that play a role in metabolism. Vitamin B12 plays a role in DNA synthesis, red blood cell formation, homocysteine metabolism, and synthesis of S-adenosylmethionine as well as enhancing nervous system and immune function.

Vitamin B1 / Thiamin – Thiamin is a water-soluble vitamin that is present in the body in several forms. Thiamine diphosphate is the coenzyme form which functions as a cofactor for several enzymes that play a role in energy production. Magnesium is needed in order to convert thiamine to its biologically active form. Thiamine deficiency (beriberi) may cause weight loss, weakness, peripheral neuropathy, edema, tachycardia, and congestive heart failure. As thiamine is not stored in the body to any significant extent and therefore a deficiency can occur within 4 to 5 days. Food sources are whole grains, legumes, nuts, meat and enriched flour.

Vitamin B2 / Riboflavin – Riboflavin is a water-soluble vitamin that is most often found in its biologically active form riboflavin-5'-phosphate and flavin adenine dinucleotide (FAD). Riboflavin is primarily involved with the formation of ATP through the cells electronic transport system. ATP is the bodies main storage form of energy and therefore a deficiency can result in fatigue. Riboflavin also is involved in various oxidation-reduction reactions and is a cofactor in the generation of glutathione. Riboflavin also aids in the conversion of vitamin B6 to its biologically active form, pyridoxal phosphate. A deficiency leads to stomatitis (cheilosis), glossitis, weakness, depression, personality changes, anemia, seborrheic dermatitis, keratitis, and conjunctivitis. Food sources are dairy, eggs, legumes, meat, fish, poultry, green leafy vegetables, fruits, and grains.

Vitamin B3/ Niacinamide/Niacin – Vitamin B3 occur naturally in 2 forms, niacinamide and niacin. Vitamin B3 is a precursor to nicotinamide adenine dinucleotide (NAD) which plays a role in the cellular electron transport system which in turn affects the production of ATP. Vitamin B3 also the precursor to NAD phosphate (NADP) which functions as a coenzyme in oxidation reduction reactions. Vitamin B3 also plays a role in tryptophan metabolism allowing it to be converted to serotonin. Deficiency can result in dementia, dermatitis, and diarrhea. A number of medical conditions such as arteriosclerosis, acne, vertigo, Alzheimer's disease, diabetes, opioid addiction, and insomnia to name a few are amenable to treatment with vitamin B3. Food sources are meat, chicken, fish, grains, legumes, and dairy products.

Vitamin B5 / Pantothenic acid – Pantothenic acid is a component of coenzyme A (CoA) which is involved with the tricarboxylic acid (Krebs) cycle for oxidation and synthesis of fatty acids, cholesterol, heme, and acetylcholine. It is also needed for amino acid catabolism. Pantothenic acid is useful for the prevention and treatment of acne vulgaris, allergic rhinitis and hypoadrenalism.

Vitamin B6 / Pyridoxine – Pyridoxine exists in nature in 3 forms, pyridoxine, pyridoxal, and pyridoxamine. The phosphate ester pyridoxal 5'-phosphate (PLP), functions as a coenzyme and is a cofactor for more than 50 enzymes. It is involved with lipid, amino acid, and carbohydrate metabolism as well as steroid hormones. Pyridoxine also plays a role in immune function by being involved in the synthesis of niacin. Because of its involvement in a wide number of enzymes pyridoxine is useful in the prevention and treatment of a large number of medical conditions. Food sources include potatoes, bananas, meat, poultry, fish, and whole grains.

Folate / Folic acid – Folic acid is the synthetic form of folate and is converted to different biologically active folates such as 5-methyltetrahydrofolate and 5, 10-methylenetetrahydrofolate. Folate plays a role in the synthesis of DNA and RNA and is involved in homocysteine and vitamin B12metabolism. It also supports the function of the immune and nervous systems. If inadequate amounts of folate are present, patients develop megaloblastic anemia but also show up as various psychiatric symptoms such as depression, anxiety, fatigue, apathy, confusion, or dementia. Additionally, it can manifest as polyneuropathy, angular cheilosis, glossitis, hypotonia in infants and children and depressed cell mediated immunity. As with other B vitamins a large number of medical conditions are prevented and treated by folate. Foods high in folate are green leafy vegetables, citrus fruits, legumes, beets, and whole grains.

Vitamin C – Vitamin C is also called ascorbic acid and can not be made by the human body. Lack of Vitamin C causes scurvy which sailors would get after a few weeks at sea. It is an antioxidant and immune system enhancer. It is essential for the formation of collagen and carnitine. Additionally, it demonstrates antiviral and antibacterial activity and helps hydroxylation reactions in mitochondria, catalyze cholesterol catabolism and is involved in the neurotransmitter metabolism. Vitamin C affects a large number of medical conditions which is why it is commonly added to nutrient IV solutions for treatment and prevention.

Vitamin D – Vitamin D can be broken down into cholecalciferol (Vit D & D3), ergocalciferol (Vit D2). Vitamin D is synthesized by the skin with exposure to ultraviolet light as well as being absorbed in the small intestine in the presence of bile salts. Vitamin D increases the absorption of calcium from the intestines and increases serum levels which can then be deposited in bone. A lack of Vitamin D can result in the development of rickets, increase in the risk of fractures, development of osteoporosis and development of psoriasis. Sources of Vitamin D are mushrooms, fish, sardines, cod-liver oil, egg yolk, lamb, and beef.

Vitamin E – Vitamin E or tocopherols are made up of 8 naturally occurring compounds that possess antioxidant activity. They can be broken down into, alpha-, beta-, gamma-, and delta-tocopherols. Alpha-tocopherol has been found to have the highest level of activity. Vitamin E is an antioxidant, stabilized cellular membranes, inhibits platelet aggregation, and has anti-

inflammatory properties. Similar to Vitamin C, Vitamin E is useful in the treatment of many medical conditions.

Biotin – Biotin is a B vitamin that functions as a cofactor for enzymes that are involved with carboxylation reactions. Biotin also plays a role in the oxidation and elongation of fatty acids and the oxidation of carbohydrates. It also induces glucokinase, the enzyme that is involved with glucose utilization. It is useful for the prevention and treatment of diabetes, brittle nails, seborrheic dermatitis during infancy and uremic neuropathy.

Vitamin K / Phytonadione – Vitamin K is a general term for a group of structurally related compounds (K1, K2, K3, K4) with a 2-methyl-1,4-naphthoquinone nucleus that possess anti-hemorrhagic activity in the body. Vitamin K is most often used to treat arteriosclerosis, cancer, cirrhosis, hemorrhagic disease in newborns, hepatitis, myelodysplasia, nausea & vomiting of pregnancy and osteoporosis. Food sources are green leafy vegetables, soybean, olive, cottonseed and canola oils, cheese, egg yolk and meat.

Zinc – Zinc is a cofactor for a number of metalloenzymes as well as participating in many biochemical pathways. It is involved in DNA and protein synthesis and is an essential element for growth, visual function, hearing, taste sensation, spermatogenesis, sexual development, immune function, and wound healing. Additionally, it acts as an antioxidant, stabilizes cell membranes, and demonstrates antiviral activity against some viruses such as COVID-19. Adverse effects of zinc include nausea, vomiting, abdominal cramping, decreased appetite, diarrhea, headache, and a a metallic taste in the mouth. Food sources are seafood, meats, whole grains, wheat germ, dairy products, legumes, peanuts, egg yolk, nuts, and seeds.

References:

Nutritional Medicine Alan R. Gaby M. D. Fritz Perlberg Publishing Concord, NH 2011

Medical Nutrition From Marz 2nd Edition Russell B. Marz, N. D. M.Ac.OM Omni Press Portland, OR August 1997

Textbook of Natural Medicine 5th Edition Joseph E. Pizzorno N. D., Michael T. Murray, N. D. Elsevier St. Louis, MO 2021