CELL SCIENCE SYSTEMS

CELLULAR NUTRITION ASSAYS

CLIA#10D0283906
Lab Director
Harold Alvarez, M.D.

CELLULAR MICRONUTRIENT ASSAY (CMA)

VITAMINS

Biotin		Vitamin B2	130% Insufficient
Delta tocotrienol	>140%Insufficient	Vitamin B3	>140%Insufficient
MK4		Vitamin B6	
MK7		Vitamin B9	
Pantothenic acid		Vitamin C	
Vitamin A		Vitamin D	
Vitamin B1	111% Borderline	Vitamin K1	
Vitamin B12	117% Borderline		

MINERALS

Boron		Magnesium	
Calcium		Manganese	
Chromium	124% Insufficient	Molybdenum	
Copper		Selenium	
Iodine	>140%Insufficient	Strontium	>140%Insufficient
Iron		Vanadium	
Lithium	>140%Insufficient	Zinc	

AMINO ACIDS

Arginine	>140%Insufficient	L-Tyrosine	
Asparagine	114% Borderline	Lysine	
Cysteine		Methionine	
Glycine	116% Borderline	Phenylalanine	
Histidine	>140%Insufficient	Taurine	
Isoleucine		Threonine	
Leucine		Tryptophan	
L-Glutamine	119% Borderline	Valine	
L-Serine			

OTHER NUTRIENTS

Carnitine		Lipoic Acid	
Choline		Omega 3 DHA	
Coenzyme Q10		Omega 3 EPA	
Glutathione	121% Insufficient	Omega 9	>140%Insufficient
Inositol			

100% - 109%	Nutrient Sufficiency
110% - 119%	Borderline Insufficiency
≥ 120%	Insufficiency*

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MICRONUTRIENTS TO ADDRESS

Strontium

Strontium is a trace mineral found in bone and connective tissue. **Important for:** • Bone formation and quality • Prevention of bone resorption • Increase bone mineral density • Anti-arthritis • Dental support **May be useful for the prevention/treatment of:** Osteoporosis, fractures, metastatic bone cancer, osteoarthritis, dental hypersensitivity, and dental caries. **Good food sources:** Spices, seafood, whole grains, root and leafy vegetables, legumes, drinking water, supplemental from- capsules, tablets.NOTE: Supplementation with strontium should be according to practitioner guidance. High dose strontium supplementation has adverse effects and is NOT recommended. Strontium supplementation is contraindicated in CVD, cerebrovascular disease, peripheral artery disease, renal disease, thromboembolic disorders.

Lithium

Lithium is a trace mineral that is present in the diet, mainly in grains and vegetables. Some people use lithium supplements as medicine -lithium is available as an FDA approved prescription medication for use in psychiatric conditions. Supplements contain much smaller quantities than prescribed medication. **Important for:** • Modulation of the nervous system function • Modulation of neurotransmitter activity- GABA, serotonin, melatonin • Modulation of circadian rhythms • May be required for normal metabolism and neural communication **May be useful for the prevention/treatment of:** Bipolar disorder, depression, schizophrenia, impulsive aggressive behavor associated with ADHD. **Good food sources:** depending on geographical location due to uneven distribution of lithium in the earth's crust: cereals, potatoes, tomatoes, cabbage, and some mineral waters. It may also be found in some spices such as nutmeg, coriander seeds, or cumin. Small amounts also found in foods from animal origin like sardines and egg yolks. IMPORTANT: Lithium interacts with a number of herbs, supplements, medications, and medical conditions. Lithium supplementation should only be used with guidance and monitoring by a qualified practitioner.

Histidine

Histidine, an essential amino acid, is involved in a wide range of metabolic processes in the body, and is needed for growth and tissue repair. **Important for:** • Protection of nerve cells • Metabolism of the neurotransmitter, histamine • Immune, gastric, and sexual function • Manufacturing of red and white blood cells • Protection of tissues against radiation and heavy metals **May be useful for the prevention/treatment of:** rheumatoid arthritis, allergic diseases, ulcers, and anemia caused by kidney failure or kidney dialysis **Good food sources:** beef, lamb, pork, poultry, fish, cheese, nuts, seeds, eggs, legumes, soybeans, quinoa, and whole grains.

Iodine

Iodine is an essential component of the thyroid hormones, triiodothyronine (T3) and thyroxine (T4), essential to control energy production/utilization in just about every cell in the body. **Important for:** • Thyroid hormone production • Essential for growth • Metabolism • Protein synthesis • Skeletal and CNS development **May be useful for the prevention/treatment of:** if deficient in iodine- hearing, hypothyroidism, and improvement in cognition. If not deficient iodine may be useful for treating fibrocystic breast changes, cyclical mastalgia, and hyperthyroidism **Good food sources:** Sea vegetables, fish and seafood, iodized salt, dairy products, eggs.

Arginine

L-arginine is an amino acid, a building block for protein synthesis, and is best known for its effects on the vascular system. **Important for:** • Vasodilation – dilatation and relaxation of blood vessels • Wound healing and enhancement of the immune system • Ammonia detoxification **May be useful for the prevention/treatment of:** anal fissure, congestive heart failure, erectile dysfunction, pre-eclampsia, sickle cell disease, esophageal spasm, infertility, interstitial cystitis, and Raynaud's disease **Good food sources:** meat, poultry, fish, dairy products, peanuts, nuts, seeds, whole grains, legumes, and chocolate.

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MICRONUTRIENTS TO ADDRESS

Delta tocotrienol

Delta tocotrienol is a natural form of vitamin E. Vitamin E is a group of eight fat soluble compounds that include four tocopherols (alpha, beta, gamma and delta) and four tocotrienols (alpha, beta, gamma, and delta). Studies suggest that tocotrienols can provide health benefits distinct from alpha-tocopherol, the most well known form of vitamin E. Tocotrienols have greater fluidity which makes it easier for the body to incorporate them into cell membranes, especially delta-tocotrienol. **Important for:** • Antioxidation • Antiaging • Anti-inflammatory • Anticancer • Brain health • Bone health • Cardiovascular effects • Prevention of platelet aggregation • Hypolipidemic effects • Neuroprotective effects **May be useful for the prevention/treatment of:** hyperlipidemia, certain types of cancer, atherosclerotic heart disease, metabolic syndrome. NAFLD, Parkinson's disease,osteopenia/osteoporosis **Good food sources:** palm oil, rice bran , annatto bean- the most potent source

Vitamin B3

Vitamin B3 occurs naturally in two forms, niacin (aka nicotinic acid) and niacinamide (aka nicotinamide). All the body's tissues convert niacin into its active form, nicotinamide adenine dinucleotide which is required for more than 400 enzymes to drive metabolic processes. **Important for:** • Conversion and release of energy from carbohydrate, protein, and fat • Brain function • Influence on serum lipid levels (niacin form only) • Regulation of blood glucose (niacin form only) **May be useful for the prevention/treatment of:** certain cardiovascular, dermatological, and psychiatric issues as well as disorders in hearing, olfactory, taste, addictions, osteoarthritis, ADHD, and insomnia **Good food sources:** meat, chicken, fish, whole grains, nuts, legumes, and dairy products

Omega 9

Oleic acid is an omega 9 fatty acid that is considered non-essential since it can be manufactured in the body but research indicates that increasing consumption of omega 9 fatty acids may be beneficial. It is an unsaturated fatty acid that is the most widely distributed and abundant fatty acid in nature, occurring naturally in the fats and oils of both animals and vegetables. **Important for:** • Anti-inflammatory • Cardiovascular effects • Brain function • Cholesterol, lipid, and blood pressure lowering • Dermatological effects- skin repair • Immune support • Fat metabolism • Insulin sensitivity • Cell membrane structure **May be useful for the prevention/treatment of:** Age related cognitive decline, type 2 diabetes, cardiovascular disease, hyperlipidemia, hypertension, Alzheimer's disease, ulcerative colitis, infections, skin conditions. **Good food sources:** Plant oils such as olive oil, almonds/almond oil, hazelnuts, avocado oil, pecans, macadamia nuts, apricot kernel oil, cashews, cheese, beef, eggs, sesame oil, sunflower oil, argan oil, grapeseed oil.

Vitamin B2

Vitamin B2, or riboflavin, is an essential vitamin involved in vital metabolic processes. It is a component of two major coenzymes flavin mononucleotide (FMN-aka riboflavin-5-phosphate) and flavin adenine dinucleotide (FAD). **Important for:** • Normal cell function, growth and development • Metabolism of carbohydrate, protein, and fat for energy production. • Cofactor needed to produce glutathione, a very important antioxidant • Homocysteine metabolism • Promotes iron metabolism • Metabolism of steroids and certain drugs **May be useful for the prevention/treatment of:** migraines, Parkinson's disease, hyperhomocysteinemia, and psoriasis **Good food sources:** turkey, sardines, eggs, legumes, soybeans, broccoli, cauliflower, Brussels sprouts, peppers, root vegetables, and squash

Chromium

Chromium is a mineral required by humans in trace amounts. **Important for:** • Insulin function • Antioxidation • Serotonin function • Carbohydrate, protein, and fat metabolism **May be useful for the prevention/treatment of:** Bipolar disorder, dementia/cognitive decline, diabetes/gestational diabetes, metabolic syndrome, depression, hyperlipidemia, PCOS, reactive hypoglycemia **Good food sources:** The content of this mineral in foods is substantially ijmpacted by agricultrual and manufacturingprocesses. whole grains- oats, barley, eggs, brewer's yeast, beef, chicken, bananas, lobster, shrimp, mushrooms, broccoli,green beans, tomatoes,Romaine lettuce, and cheese

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MICRONUTRIENTS TO ADDRESS

Glutathione

Glutathione is produced in the liver from the amino acids, glycine, cysteine, and glutamic acid. It is considered the body's "master antioxidant". **Important for:** • DNA synthesis and repair • Metabolism of toxins and carcinogens • Immune support • Prevention of oxidative cell damage • Protein and prostaglandin synthesis • Transport of amino acids • Antioxidation,-fights free radicals • Antiviral • Anti-inflammation **May be useful for the prevention/treatment of:** cancer, Parkinson's disease, neurodegenerative disorders, flu, AMD, glaucoma, cataracts, diabetes, heart disease, asthma (not inhaled glutathione), lung disease, liver disease, GI disease, CFS, and side effects of chemotherapy **Good food sources:** Fruit, vegetables, and meat but glutathione is poorly absorbed from the GI tract. Consuming foods used in cysteine production is recommended- onions, garlic, chives, leeks. Supplementing with N-acetyl L Cysteine can boost glutathione levels. Glutathione can be taken IV or in liposomal supplemental form.

L-Glutamine

Glutamine is the most abundant free amino acid in the body, it is produced primarily in skeletal muscle and released into the circulation. **Important for:** • Protein, DNA, RNA, and neurotransmitter synthesis • Fuel source cells that line the small intestine • Fuel source for immune cells, such as macrophages • Maintaining nitrogen balance • Preventing the burning of other amino acids for energy **May be useful for the prevention/treatment of:** acquired immunodeficiency syndrome, alcohol addiction, burns, gastroenteritis pancreatitis, and peptic ulcer, and for preventing infections following intense exercise **Good food sources:** meat, chicken, fish, cheese, milk, yogurt, legumes, and lentils

Vitamin B12

Vitamin B12 is a group of compounds called cobalamins. **Important for:** • DNA (genetic material) synthesis • Red blood cell formation • Nervous system and immune system function • Metabolism of homocysteine **May be useful for the prevention/treatment of:** issues of the skin, ears/nose/throat, issues associated with aging, and certain conditions/disorders of the cardiovascular, gastrointestinal, musculoskeletal, immune, and nervous systems **Good food sources:** Vitamin B12 is found almost exclusively in animal products- meat, poultry, fish, eggs, and dairy products. Beef liver and clams are the highest sources. B12 fortified breakfast cereals and nutritional yeasts.

Glycine

Although not considered "essential" because it is made from serine, glycine is considered a conditionally essential amino acid because there are many metabolic demands for it- including heme biosynthesis, collagen formation, and its role in digestion, detoxification and neurotransmitter action. **Important for:** • Collagen formation • Heme synthesis • Detoxification • Glutathione synthesis • Energy source/synthesis of glucose • Brain neurotransmitter effect/CNS function • Anti-cancer • Antioxidation **May be useful for the prevention/treatment of:** • Schizophrenia • Stroke • Seizures • Memory and cognitive performance in psychosis risk syndrome • Cystic fibrosis • Gout • Insomnia • Venous leg ulcers • Certain types of cancer **Good food sources:** gelatin, protein rich foods including meat, fish, dairy, and legumes

Asparagine

L-Asparagine is a non-essential amino acid required for the synthesis of many important cellular proteins and other amino acids. **Important for:** • Energy production • Brain and nervous system function • Metabolism of ammonia **May be useful for the prevention/treatment of:** fatigue **Good food sources:** poultry eggs, dairy, fish, meat, nuts, seafood, seeds, potatoes, asparagus, soy, and whole grains

Vitamin B1

Vitamin B1, thiamin, or thiamine functions plays an important role in energy metabolism, growth, development, and function of cells. **Important for:** • as a cofactor for enzymes that play a role in energy production • Support of the nervous system, muscles, heart, brain, and digestive system. **May be useful for the prevention/treatment of:** epilepsy, Parkinson's disease, sciatica, back pain, CHF, cognitive decline, diabetes, fibromyalgia, and hepatitis **Good food sources:** Whole grains, meat, fish

IMPORTANT! Identified adverse food reactions- allergies, sensitivities, and intolerances- should be avoided even if these cellular tests have shown those food sources of micronutrients/botanicals to be "beneficial." The CMA and APA test the responses of B and T lymphocytes, not antibodies (IgE-mediated allergies) or cells of the innate immune system (Alcat Test). Patients and practitioners are encouraged to carefully read all product/supplement labels and avoid all ingredients that are contraindicated for any reason.

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