A Patient Sample Report

regenr8

Delivering Personalized Wellness

Epigenetic Biomarker Profile

Regenr8 - Female Epigenetic Biomarker Profile

Delivering Personalized Wellness

Patient Information	Clinician/Order Information	Sample Information
Jane Doe **DOB: 1/9/1965** **Age: 55** Gender: Female Phone: 8773168686 Patient ID: a9c17312 Height: 5'.3" Weight: 165lbs	**Regenr8** Order date: 3/12/2020	**Accession# 20-0005475** Collected: 3/5/2020 Received: 3/7/2020 Reported: 3/13/2020 Collection times: **1st** 7:00am

Summary Report

Assessment Score Good, Fair, Poor	Potential Intervention	Practitioner Recommendation
Overall Cellular Energy Production 	• Carnitine (Pumpkin Seeds, Sunflower Seeds, Sesame Seeds, Legumes, Peas, Lentils, Mushrooms, Avocados, Carrots, Apricots, Bananas, Grains, Red Meat), lysine (if lysine is low)and Vitamin B2 (if adipic, suberic and succinic acids are elevated). • Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load	
B-Vitamin/Methylation Cofactor Assessment 	• Vitamins B12 (cobalamin), B6 (pyridoxine), Folic Acid, Betaine (Whole Wheat, Wheat Bran, Wheat Germ, Spinach, Beetroot, Broccoli, Spinach), Magnesium (Green leafy Vegetables, Spinach, Sunflower Seeds, Sesame Seeds, Paprika, Ginger, Onion, Kelp) or methyl donors (with elevated MMA all of the above)	

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Summary Report

Assessment Score Good, Fair, Poor	Potential Intervention	Practitioner Recommendation
Inflammation and Oxidative Stress Assessment 	• Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load • Decrease intestinal overgrowth, reduce sugars, fiber supplements and consider antibiotics in very high levels confirmed in other bacterial overgrowth markers	
Muscle Assessment 		
Gut Assessment 	• Vitamin B6 (pyridoxine), investigate insulin resistance • Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load • Decrease intestinal overgrowth, reduce sugars, fiber supplements and consider antibiotics in very high levels confirmed in other bacterial overgrowth markers • Folic Acid, Histidine (Beef, Turkey, Chicken, Bananas, Broccoli, Cauliflower, Corn) • 5-HTP	

Summary Report

Assessment Score Good, Fair, Poor	Potential Intervention	Practitioner Recommendation
Essential Amino Acids 	• Vitamin B6 (pyridoxine), investigate insulin resistance • Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load • Folic Acid, Histidine (Beef, Turkey, Chicken, Bananas, Broccoli, Cauliflower, Corn) • 5-HTP	
Non-Essential Amino Acids 		

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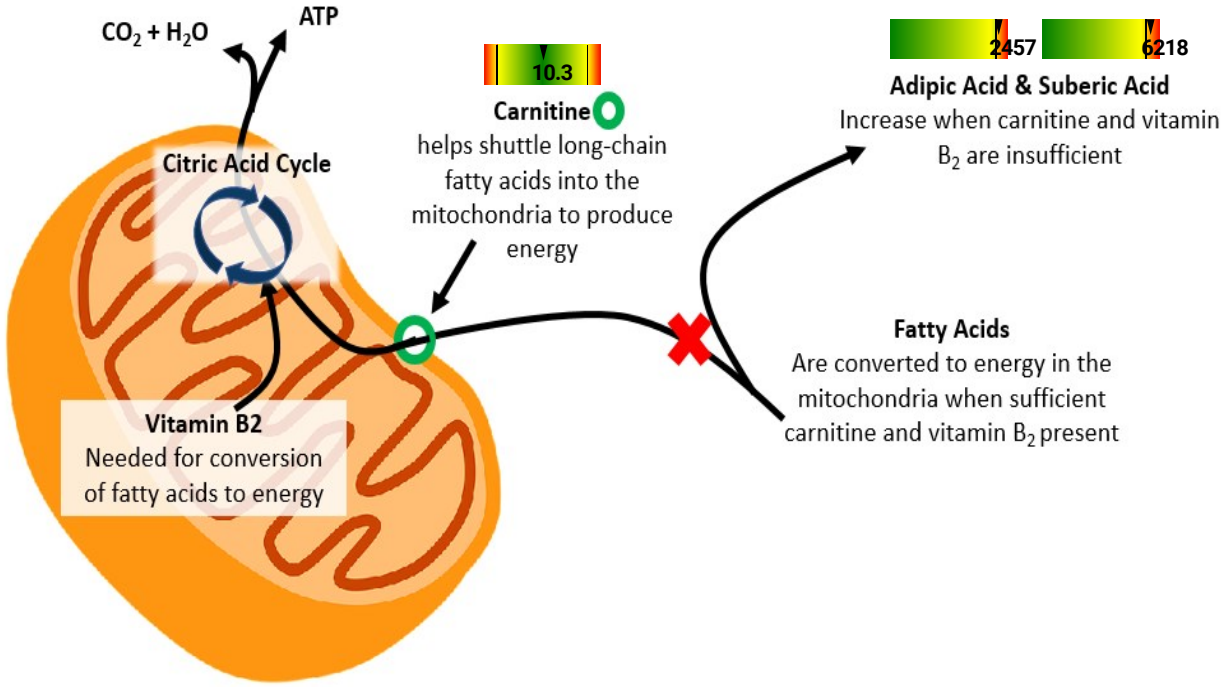
Cellular Energy Production
Fatty Acid Metabolism

Analyte of Measure	Units	Observation	Target Range
Adipic Acid	ng/mg CR	Elevated	< 2272 (2457)
Carnitine	ug/mg CR		2.3 – 18.2 (10.3)
Suberic Acid	ng/mg CR	Elevated	< 1953 (6218)

Most of the body's energy is generated from burning fatty acids in the citric acid cycle within the mitochondria. Carnitine is required for the shuttling of fatty acids into the mitochondria. When carnitine is deficient, fatty acids are converted to adipic acid and suberic acid. When B2 is lacking, elevations will be seen in adipic, suberic and succinic acids.



Function	Possible Causes	Complications	Recommendations
• Adipic Acid - Fatty Acid Metabolism • Suberic Acid - Fatty Acid Metabolism	• Adipic/Suberic acid elevations caused by inability to shuttle fatty acids into the mitochondria or CAC disruptions	• Reduced energy production, muscle weakness and signs of ethylmalonic or adipic aciduria. Symptoms may appear following high stress events.	• Carnitine (Pumpkin Seeds, Sunflower Seeds, Sesame Seeds, Legumes, Peas, Lentils, Mushrooms, Avocados, Carrots, Apricots, Bananas, Grains, Red Meat), lysine (if lysine is low)and Vitamin B2 (if adipic, suberic and succinic acids are elevated).

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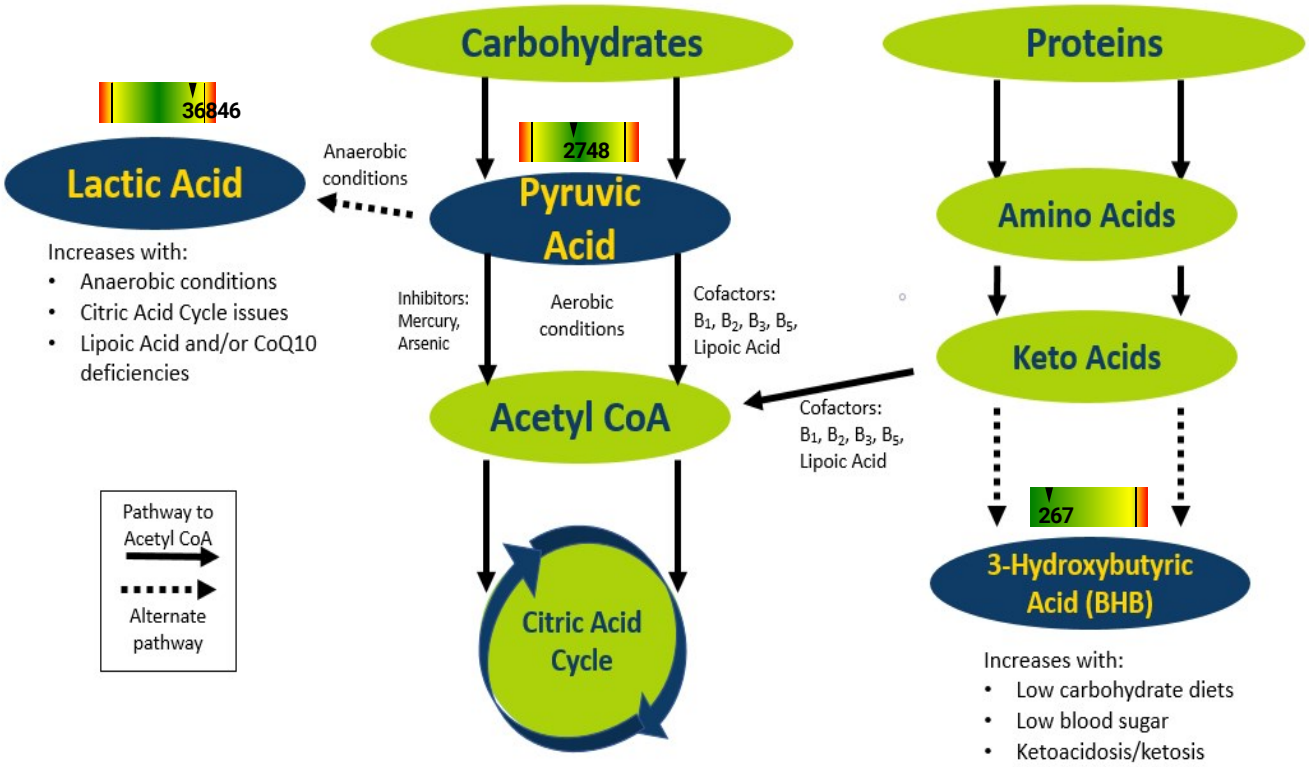
Cellular Energy Production
Carbohydrate Metabolism

Analyte of Measure	Units	Observation	Target Range
3-Hydroxybutyric Acid	ng/mg CR		< 838 (267)
Lactic Acid	ng/mg CR		6698 – 41579 (36846)
Pyruvic Acid	ng/mg CR		698 – 5371 (2748)

Pyruvic Acid is a precursor to Acetyl-CoA at the top of the citric acid cycle (CAC), however, when cofactors B1, B2, B3 and B5 are deficient, pyruvic acid cannot oxidize to Acetyl-CoA and will start to accumulate. Lactate will also accumulate in this state because lactic acid increases as pyruvic acid increases in these cases. Lactic acid can also increase when CoQ10 deficiencies exist. When this happens pyruvate will be much lower than lactic acid and HMG will elevate as well. 3-Hydroxybutyric Acid is a keto acid and can become elevated during very low calorie diets, fasting and/or in patients with diabetes.



Function	Possible Causes	Complications	Recommendations

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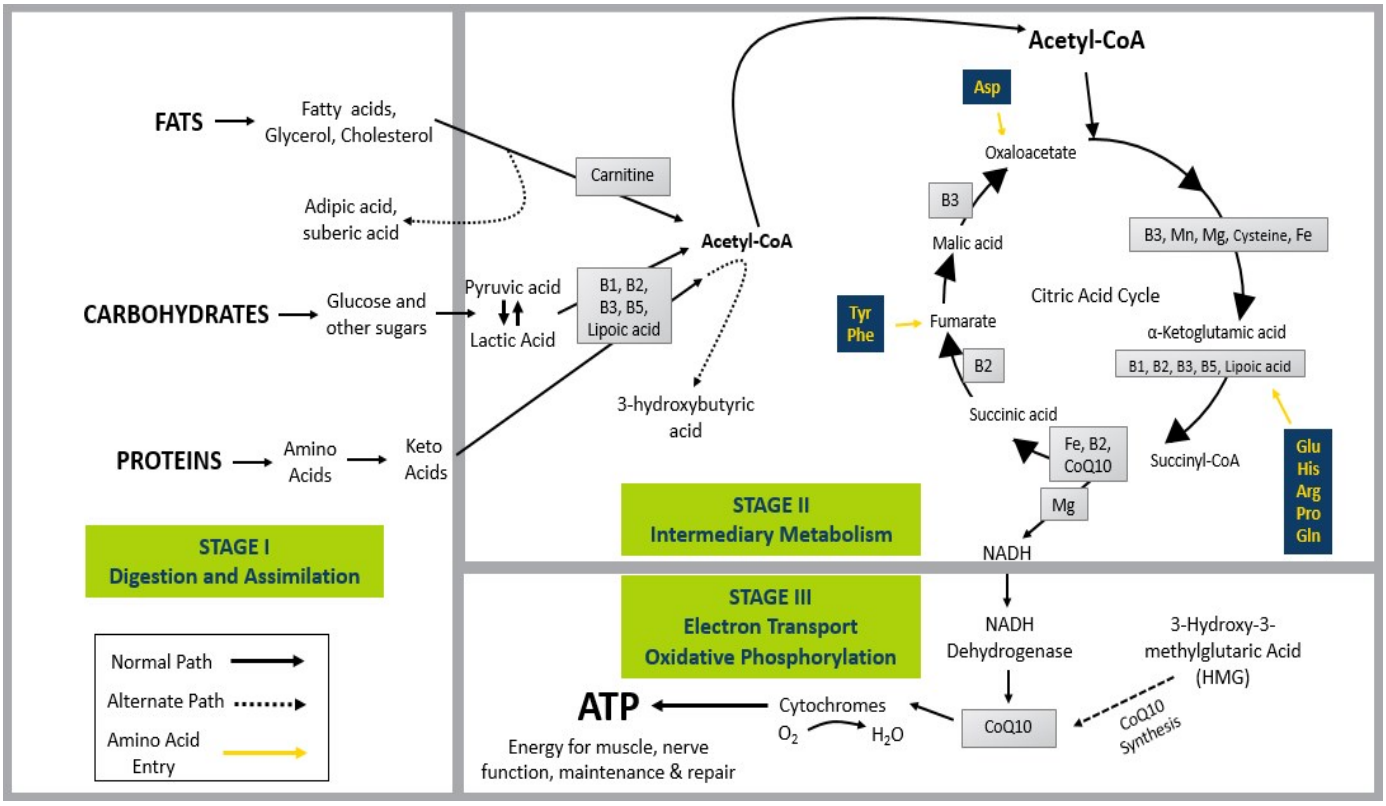
Cellular Energy Production
Other Analytes

Analyte of Measure	Units	Observation	Target Range
Overall Cellular Energy Production	Score		
3-Hydroxy-3-methylglutaric Acid (HMG)	ng/mg CR		< 4286 (3024)
Lactic Acid	ng/mg CR		6698 – 41579 (36846)
Malic Acid	ng/mg CR		< 14760 (13253)
Succinic Acid	ng/mg CR		< 29241 (14096)
Taurine	ug/mg CR	Elevated	18.7 – 147 (148)

The remaining analytes are associated with other areas of the citric acid cycle and can indicate certain cofactor deficiencies. When succinic acid or HMG levels are elevated, this is an indication of a CoQ10 deficiency. This can be further confirmed when malic acid is low (also associated with CoQ10 deficiency). When succinic acid is elevated without increases in HMG, this can indicate a lack of riboflavin (B2) and/or magnesium. When both malic acid and HMG are elevated, this is an indication of defects in the electron transport chain that are not associated with CoQ10 deficiency. Taurine is a conditionally essential amino acids that can be synthesized by cysteine when B6 levels are adequate. Vegetarian diets may have low levels of taurine and should supplement with B6 and taurine.



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Cellular Energy Production - Other Analytes

Function	Possible Causes	Complications	Recommendations
• Taurine - An antioxidant with roles in energy production, protein synthesis, osmoregulation, membrane stabilization, and modulation of calcium signaling. It is essential for cardiovascular function, as well as development and function of skeletal muscle, the retina, and the central nervous system.	• Taurine is a conditionally essential amino acids that can be synthesized by cysteine when Vitamin B6 levels are adequate. Elevated levels can indicate liver issues or muscle damage but are usually associated with high-taurine diets. Taurine is also influenced by genetic SNPs of the CBS C699T gene.	• Muscle damage, Inflammation, cardiovascular and neurological effects in addition to fatigue	• Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load

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B-Vitamin/Methylation Cofactor Assessment

Analyte of Measure	Units	Observation	Target Range
B-Vitamin/Methylation Cofactor Assessment	Score		
2-Amino butyric Acid	ng/mg CR	Low	305 – 773 (129)
Cystathionine	ng/mg CR		1061 – 4935 (1126)
Glycine	ug/mg CR		37.1 – 123 (46.5)
Homocystine	ng/mg CR	Below Detection Limit	< 53
Kynurenic Acid	ng/mg CR		< 2273 (649)
Methylmalonic Acid	ng/mg CR		< 1498 (839)
Sarcosine	ng/mg CR		< 147 (28)
Serine	ng/mg CR		842 – 24596 (20458)

B Vitamins are essential cofactors in almost every step of energy production, protein synthesis, detoxication and metabolism. B vitamins are responsible for decarboxylation, redox reactions, acting as carriers for acyl groups, metabolism of amino acids, carriers for methyl groups in methylation and many other functions in the human body. The markers analyzed in this section indicate which Vitamins, minerals and cofactors are needed to maintain the various pathways and cycles associated with B-Vitamin functionality.

B-Vitamin/Methylation Cofactor Assessment

Abbr.	Name	Function	Dietary Sources
B1	Thiamine	Energy metabolism, collagen synthesis, nervous system, thyroid function	Liver, meat, whole grains zucchini, beans, lentils, peas
B2	Riboflavin	Energy metabolism, antioxidant, heme formation, nervous system	Liver, meat, dairy/eggs, cruciferous veg, mushrooms, spinach
B3	Niacin	Energy metabolism, brain/concentration, DNA synthesis, skin and mucosal membrane	Liver, meat, fish, mushrooms, peanuts, kale, beans, lentils, peas, asparagus
B5	Pantothenic acid	Energy metabolism, cholesterol, hormones, immune system, mucous membrane, skin and nails, connective tissue.	Liver, meat, herring, nuts, dairy/eggs, mushrooms, beans, lentils, peas
B6	Pyridoxine	Energy metabolism, homocysteine metabolism, immune system, nervous system, brain/mental performance	Liver, meat, fish, nuts, cruciferous veg, carrots, potato, beans, lentils, peas
B7	Biotin	Energy metabolism, cholesterol, hormone, DNA and protein synthesis, homocysteine metabolism, skin, hair, nails and blood glucose regulation	Liver, meat, dairy/eggs, soybeans, peas, oysters
B9	Folic acid / folate	Heme formation, cell proliferation, homocysteine metabolism	Liver, meat, cruciferous veg, bran, green veg, dairy/eggs
B12	Cobalamin	Energy metabolism, homocysteine metabolism, nervous system, DNA synthesis, cell proliferation, heme formation	Liver, meat, fish, mussels

Function	Possible Causes	Complications	Recommendations
• Homocystine - Although each of these analytes has its own function, in this section, each analyte is for the purpose of identifying vitamin B sufficiency. • 2-Aminobutyric Acid - Although each of these analytes has its own function, in this section, each analyte is for the purpose of identifying vitamin B sufficiency.	• When Homocystine is elevated with normal methylmalonic acid, Vitamin B6 or Folate is recommended. Homocystine is inversely correlated with Folate, and Vitamin B12 in blood so as these are increased (through supplementation), homocysteine levels decrease accordingly. Homocystine is also influenced by genetic SNPs of MTHFR C677T, MTR and TCN2 genes. Homozygous for the MTR gene results in low methionine and high homocysteine levels.	• Increases in Homocystine are associated with osteoporosis and central nervous system disorders and increased risk of atherosclerosis, cardiovascular disease, ocular, muscular, neurological and joint complications.	• Vitamins B12 (cobalamin), B6 (pyridoxine), Folic Acid, Betaine (Whole Wheat, Wheat Bran, Wheat Germ, Spinach, Beetroot, Broccoli, Spinach), Magnesium (Green leafy Vegetables, Spinach, Sunflower Seeds, Sesame Seeds, Paprika, Ginger, Onion, Kelp) or methyl donors (with elevated MMA all of the above)

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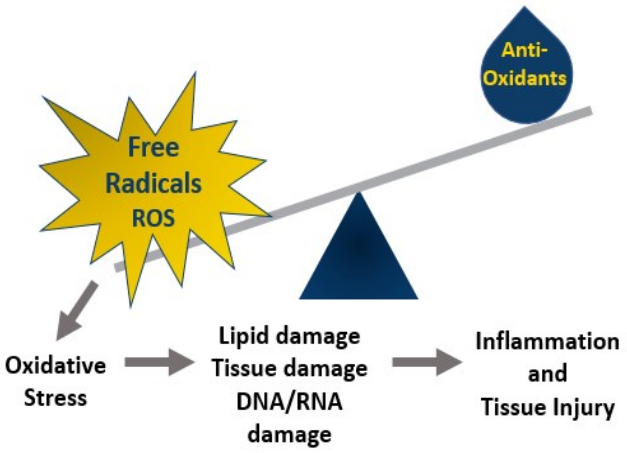
Inflammation and Oxidative Stress

Analyte of Measure	Units	Observation	Target Range
Inflammation and Oxidative Stress Assessment	Score		
3-Aminoisobutyric Acid	ng/mg CR	Low	2563 – 10703; 1441
6-Sulfatoxymelatonin	ng/mg CR	Below Detection Limit	6 – 24.4
8-OH-dG	ng/mg CR	Elevated	< 5.1; 6
Allantoin	ug/mg CR	Elevated	8.1 – 28.9; 31.5
Benzoic Acid	ng/mg CR		< 21592; 15232
Cystathionine	ng/mg CR		1061 – 4935; 1126
Hippuric Acid	ug/mg CR	Elevated	< 288; 387
Pyroglutamic Acid	ng/mg CR		8964 – 14079; 9467
Taurine	ug/mg CR	Elevated	18.7 – 147; 148

Oxidative stress is a condition that results in increasing levels of free radicals that create an environment of increasing cellular damage over normal cellular function. While cellular damage is always present, antioxidants act as scavengers of reactive oxygen species (ROS) and free-radicals to maintain a balance between cellular function and cellular damage. The markers analyzed in this section are either indicative of oxidative stress or assess cofactors and recovery mechanisms required to maintain the normal flow of mitochondrial respiration (the greatest source of ROS). Additionally, certain gut dysbiosis and other inflammatory markers are included in this section due to the ability for oxidative stress to cause inflammatory responses and gut disturbances as well.

Inflammation and Oxidative Stress

Although some oxidative stress is required for cell signaling and regulating certain immune responses, oxidative stress is a general term to define the damage that arises from an excess of free radicals in relative ratio to the capacity of antioxidant defenses. Oxidative stress effects a number of pathways and tissues but it primarily marked in lipids, proteins and nucleic acids resulting in systemic tissue injury and/or inflammation.



Antioxidants	
Endogenous	**Exogenous**
Glutathione	Vitamins A, C, K, E
Thioredoxin (TRX)	Phenolic Acids resveratrol, curcumin
Ubiquinone	Ubiquinone
Uric acid	Beta-carotene
Lipoic Acid	Flavonoids
Bilirubin	Quercetin
Catalase	
Superoxide dismutase (SOD)	
Glutathione peroxidase	

Function	Possible Causes	Complications	Recommendations
• 8-OH-dG - Indicator of oxidative damage to DNA • Allantoin - Stimulates the growth of healthy tissue (specifically skin and mucous membranes). Biomarker of oxidative stress in chronic illnesses • Hippuric Acid - A product of benzoic acid and glycine • Melatonin - Regulator of the sleep-wake cycle. • Taurine - An antioxidant with roles in energy production, protein synthesis, osmoregulation, membrane stabilization, and modulation of calcium signaling. It is essential for cardiovascular function, as well as development and function of skeletal muscle, the retina, and the central nervous system.	• 8-OH-dG elevations are caused by oxidative stress and can be influenced by genetic SNPs of the ATG12 gene. • Allantoin, is a biomarker of oxidative stress and is the predominant product of free radical-induced oxidation of uric acid. Some studies note allatoin ability to modulate the inflammatory response which can aid in healing. • Elevated hippuric acid indicate intestinal overgrowth of bacteria and gut inflammation. • Melatonin is usually elevated when taking a melatonin but can be associated with rare health issues	• Oxidative stress, DNA damage, aging • Overgrowth of bacteria and gut inflammation • Muscle damage, Inflammation, cardiovascular and neurological effects in addition to fatigue	• Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load • Decrease intestinal overgrowth, reduce sugars, fiber supplements and consider antibiotics in very high levels confirmed in other bacterial overgrowth markers

Inflammation and Oxidative Stress

Function	Possible Causes	Complications	Recommendations
• 3-Aminoisobutyric Acid - Indicator of a catabolic pathway resulting from DNA and RNA degradation	• Taurine is a conditionally essential amino acids that can be synthesized by cysteine when Vitamin B6 levels are adequate. Elevated levels can indicate liver issues or muscle damage but are usually associated with high-taurine diets. Taurine is also influenced by genetic SNPs of the CBS C699T gene.		

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Muscle Assessment

Analyte of Measure	Units	Observation	Target Range
Muscle Assessment	Score		
1-Methyl-Histidine	ug/mg CR	Low	
3-Aminoisobutyric Acid	ng/mg CR	Low	
3-Methyl-Histidine	ug/mg CR		
5-Hydroxylysine	ng/mg CR	Low	
Anserine	ng/mg CR		
Beta-Alanine	ng/mg CR		
Carnosine	ng/mg CR		
Citrulline	ng/mg CR		
Hydroxyproline	ng/mg CR		
Ornithine	ng/mg CR		
Proline	ng/mg CR		

The markers in this section fall into one of the following two categories; markers of damage and degradation of muscle or markers that contribute to muscle repair and healing. Indicators of muscle damage include 1-Methyl-Histidine, 3-Aminoisobutyric Acid, 3-Methyl-Histidine, 5-Hydroxylysine, Anserine, Citrulline and Ornithine. Beta-alanine, Carnosine, Proline and Hydroxyproline fall into the repair and healing category.

Muscle Assessment

Damage & Injury Markers

Ornithine
Citrulline
5-Hydroxylysine
3 & 1-Methyl-Histidines
3-Aminoisobutyric Acid

Maintenance & Healing Markers

Beta-Alanine
Carnosine
Anserine
Hydroxyproline

Function	Possible Causes	Complications	Recommendations
• 1-Methyl-Histidine - Metabolic indicator or meat consumption (specifically red meat) • 3-Aminoisobutyric Acid - Biomarker for skeletal muscle injury • 5-Hydroxylysine - Biomarker for bone loss and connective tissue degradation	• 1-methyl-histadine is expected to be low in vegetarians as it is mainly derived from the hydrolysis of anserine in meat and chicken.		

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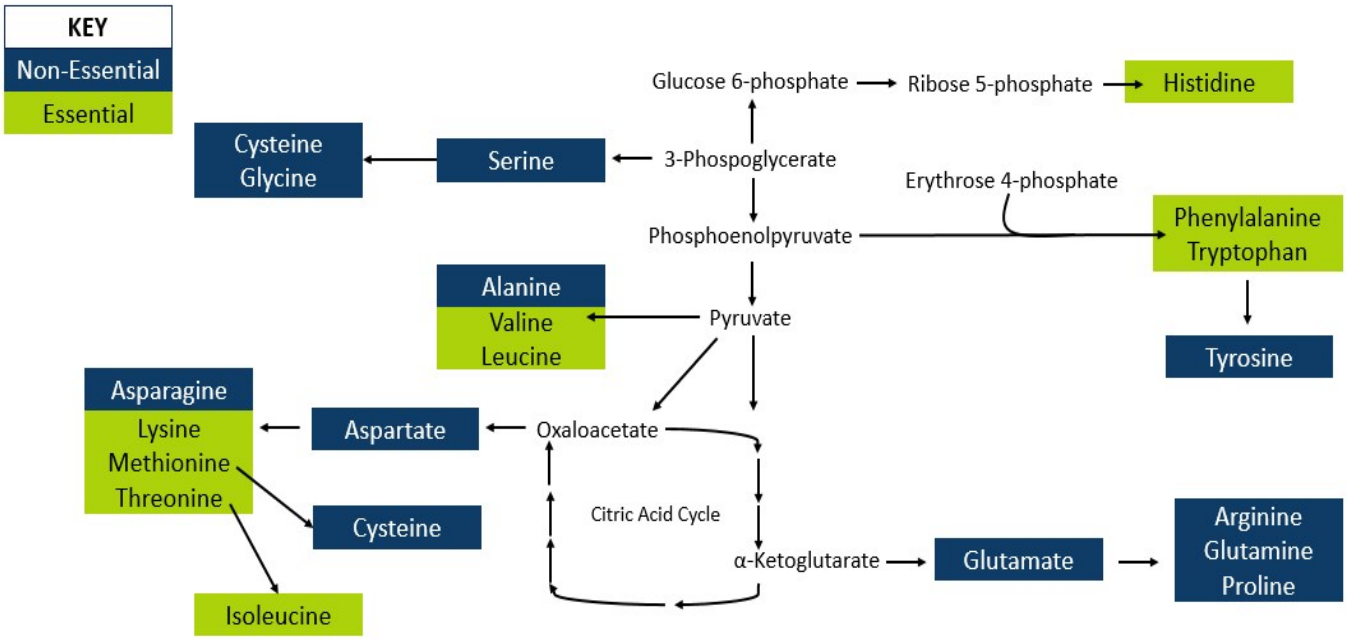
Amino Acids

Analyte of Measure	Target Range (ng/mg CR)*
Essential Amino Acids	
Histidine	35.4 – 100; 32.3
Isoleucine	180 – 1162
Leucine	246 – 2568; 540
Lysine	3.7 – 17.1; 5.4
Methionine	56.1 – 606; 162
Phenylalanine	1931 – 5404; 2658
Taurine	18.7 – 147; 148
Threonine	2.5 – 11.4; 9.3
Tryptophan	2928 – 7367; 2749
Valine	740 – 3274; 780

Analyte of Measure	Target Range (ng/mg CR)*
Non-Essential Amino Acids	
Alanine	7.6 – 18.8; 12.1
Arginine	1031 – 3364; 2446
Asparagine	2824 – 9719; 4232
Aspartic Acid	< 3530; 1836
Cystine	5.7 – 17.2; 12.3
GABA	0 – 180; 90.7
Glutamic Acid	2554 – 9902; 3751
Glutamine	8.2 – 38.9; 16.2
Proline	336 – 1469; 415
Tyrosine	1903 – 9504; 4614

Amino acids are the direct transcription of DNA and are critical to virtually every function in the human body. Due to the nature of amino acid synthesis and the purposes carried out by these protein-building blocks, when amino acids increase or decrease in urine, pathway interruptions and dysfunctions can be identified and corrected through amino acid replacement or replacing a missing cofactor involved in the amino acid metabolic pathway. There are about 20 amino acids that can be broken into 2 main categories; Essential and Non-essential Amino Acids. The human body used to create all amino acids in the presence of the appropriate vitamin/nutrient cofactors, however, over time, genetic mutations related to amino acid production and transport led to the separation of non-essential amino acids made by the body and essential amino acids ingested from diet. Essential amino acids must be ingested to meet daily demands because they either cannot be created by the body (essential) or cannot be created at levels high enough to meet the daily requirements (conditionally essential). Non-essential amino acids are created within the human body and therefore their source is not dietary. Note: Conditionally essential amino acids are often listed with essential amino acids as these amino acids can be both created in the body and ingested in the diet. (*) The following amino acids are in ug/mg CR units; Essential AA: Histidine, Lysine, Taurine & Threonine; Non-Essential AA: Alanine, Cystine, Glutamine.

Amino Acids



Function	Possible Causes	Complications	Recommendations
• Isoleucine - Increase energy levels and assist in recovery from strenuous physical activity. • Taurine - An antioxidant with roles in energy production, protein synthesis, osmoregulation, membrane stabilization, and modulation of calcium signaling. It is essential for cardiovascular function, as well as development and function of skeletal muscle, the retina, and the central nervous system. • Histidine - Maintaining normal pH of 7 and also contributes to hemoglobin production	• When BCAAs, such as Leucine, Isoleucine or Valine are elevated in urine, this is generally and indication of a deficit in cofactor Vitamin B6 or the cofactors required for the branched-chain ketoacid dehydrogenase complex (BCKDC) such as thiamin, thiamin pyrophosphate, riboflavin, niacin, pantothenic acid and Lipoic acid.	• Insulin resistance • Muscle damage, Inflammation, cardiovascular and neurological effects in addition to fatigue • Rheumatoid arthritis • Low tryptophan is associated with disorders such as insomnia, depression, anxiety, bipolar disorder and migraines	• Vitamin B6 (pyridoxine), investigate insulin resistance • Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load • Folic Acid, Histidine (Beef, Turkey, Chicken, Bananas, Broccoli, Cauliflower, Corn) • 5-HTP

Amino Acids

Function	Possible Causes	Complications	Recommendations
• Tryptophan - Amino acid required to produce niacin, melatonin, and serotonin. Tryptophan metabolism is a key modulator of gut microbiota.	• Taurine is a conditionally essential amino acids that can be synthesized by cysteine when Vitamin B6 levels are adequate. Elevated levels can indicate liver issues or muscle damage but are usually associated with high-taurine diets. Taurine is also influenced by genetic SNPs of the CBS C699T gene. • Low histidine is often due to low dietary intake, rheumatoid arthritis, decreases in folic acid (needed for production and metabolism) • When tryptophan is low, serotonin levels drop. Serotonin can be rescued through the use of 5-HTP which is the intermediary between Tryptophan and serotonin. Tryptophan is also required for protein synthesis (which cannot be replaced by the use of 5-HTP) so tryptophan replacement in a balanced amino acid supplement can increase both tryptophan and serotonin. Take caution when using 5-HTP or Tryptophan isolate in patients taking SSRIs. Tryptophan is also influenced by genetic SNPs of the IDO1 gene.		

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Gut Assessment

Analyte of Measure	Units	Observation	Target Range
Gut Assessment	Score		
3-Hydroxy-3-methylglutaric Acid (HMG)	ng/mg CR		< 4286 — 3024
Acetoacetic Acid	ng/mg CR	Elevated	76.5 — 1050 — 1217
Allantoin	ug/mg CR	Elevated	8.1 — 28.9 — 31.5
Benzoic Acid	ng/mg CR		< 21592 — 15232
Carnosine	ng/mg CR		1866 — 10188 — 6918
Glutamine	ug/mg CR		8.2 — 38.9 — 16.2
Hippuric Acid	ug/mg CR	Elevated	< 288 — 387
Histidine	ug/mg CR	Low	35.4 — 100 — 32.3
Lactic Acid	ng/mg CR		6698 — 41579 — 36846
Pyruvic Acid	ng/mg CR		698 — 5371 — 2748
Tryptophan	ng/mg CR	Low	2928 — 7367 — 2749

The gut is the central center for overall health and balance. This is evident through the observation that the gut consumes about 1/3 of the energy produced daily and is the only organ system that has its own nervous and lymphatic system. The markers analyzed in this section are related to bacterial overgrowth or gut dysbiosis which can compromise the lining of the gastrointestinal (GI) tract. When the lining of the GI tract is compromised, certain nutrients can "leak" out of the gut instead of going into the bloodstream. When this happens, the nutrients intended to support energy production, protein synthesis, and other key functions are not efficiently absorbed (often causing deficiencies) and the body launches an immune response to address the overgrowth of GI bacteria, as well as, any nutrients, etc. that have leaked outside of the gut. This immune response leads to inflammation which, when left untreated, can cascade into many other disfunctions and disorders.

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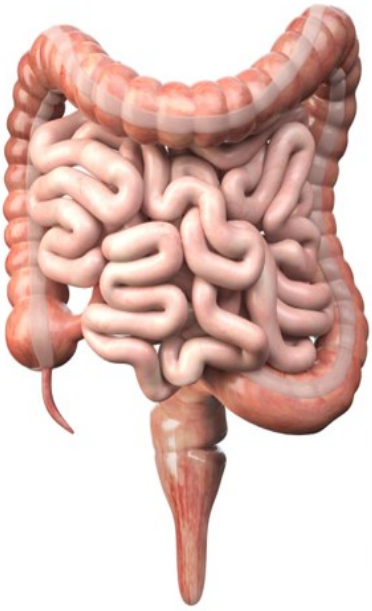
Gut Assessment

Positive Contributors
- Probiotic Balance though diet and/or supplements
- Dietary fiber intake
- Regular Exercise
- Proper Sleep
- Appropriate cofactors

Negative Contributors
- Antibiotics
- Bacterial overgrowth/imbalance/dysbiosis
- Proton pump inhibitors
- High fat diet (saturated fats)
- High protein diet
- Altered pH
- Increased sugar intake (fructose)



Healthy Gut Responses
- Increased short-chain fatty acid production
- Increased antioxidant production
- Improved lipid metabolism
- Improved insulin sensitivity
- Improved detoxification
- Decreased risk of infections, cardiovascular disease and other systemic and inflammatory diseases
- Decreased risk of gut inflammation

Unhealthy Gut Responses
- Decreased short-chain fatty acids
- Insulin resistance
- Increased Lipopolysaccharides
- Increased risk of cardiovascular disease and other systemic & inflammatory diseases
- Gut inflammation
- Cognitive decline
- Increased sensitivity to allergens

Function	Possible Causes	Complications	Recommendations
• Acetoacetic Acid - Ketone bodies, mainly β-hydroxybutyrate and acetoacetic acid, are important alternative energy sources in a state of energy deficit or metabolic crisis. • Allantoin - Stimulates the growth of healthy tissue (specifically skin and mucous membranes). Biomarker of oxidative stress in chronic illnesses • Hippuric Acid - A product of benzoic acid and glycine • Histidine - Maintaining normal pH of 7 and also contributes to hemoglobin production • Tryptophan - Amino acid required to produce niacin, melatonin, and serotonin. Tryptophan metabolism is a key modulator of gut microbiota.	• Acetoacetic acid elevation - These levels will increase in fasting conditions and in response to Type II diabetes. • Allantoin, is a biomarker of oxidative stress and is the predominant product of free radical-induced oxidation of uric acid. Some studies note allatoin ability to modulate the inflammatory response which can aid in healing. • Elevated hippuric acid indicate intestinal overgrowth of bacteria and gut inflammation. • Low histidine is often due to low dietary intake, rheumatoid arthritis, decreases in folic acid (needed for production and metabolism)	• Poor metabolism leading to excessive fatty acid breakdown (diabetes mellitus leading to diabetic ketoacidosis) • Oxidative stress, DNA damage, aging • Overgrowth of bacteria and gut inflammation • Rheumatoid arthritis • Low tryptophan is associated with disorders such as insomnia, depression, anxiety, bipolar disorder and migraines	• Vitamin B6 (pyridoxine), investigate insulin resistance • Zinc, antioxidants (vitamins A, E, C, beta-carotene, CoQ10 (Salmon, Sardines, Mackerel, Spinach, Beef Heart, Pork Heart, Chicken, Sesame Seeds), lipoic acid (Spinach, Broccoli, Sweet Potatoes, Potatoes, Yeast, Tomatoes, Peas, Brussel Sprouts, Carrots, Beets, Rice Bran), decrease oxidant load • Decrease intestinal overgrowth, reduce sugars, fiber supplements and consider antibiotics in very high levels confirmed in other bacterial overgrowth markers • Folic Acid, Histidine (Beef, Turkey, Chicken, Bananas, Broccoli, Cauliflower, Corn) • 5-HTP

Gut Assessment

Function	Possible Causes	Complications	Recommendations
	• When tryptophan is low, serotonin levels drop. Serotonin can be rescued through the use of 5-HTP which is the intermediary between Tryptophan and serotonin. Tryptophan is also required for protein synthesis (which cannot be replaced by the use of 5-HTP) so tryptophan replacement in a balanced amino acid supplement can increase both tryptophan and serotonin. Take caution when using 5-HTP or Tryptophan isolate in patients taking SSRIs. Tryptophan is also influenced by genetic SNPs of the IDO1 gene.		

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