

Metabolomix+

REDESIGNED
REIMAGINED

CLINICIAN INFORMATION

METABOLOMIX+ : A NON-INVASIVE PERSONALIZED ASSESSMENT

Metabolomix+ is a urinary nutritional evaluation that includes key organic acids and amino acids to evaluate the functional need for antioxidants, B-vitamins, minerals, digestive support, and amino acids.

Metabolomix+ also includes the option of additional Essential & Metabolic Fatty Acids, Toxic and Nutrient Elements, plus Genomics.

The Metabolomix+ provides targeted nutrient therapeutics designed to give insight into:

- Mood disorders^{1,2}
- Cardiovascular disease^{3,4}
- Metabolic syndrome^{5,6}
- Fatigue^{7,8}
- Obesity and weight issues^{9,10}
- Cognitive decline^{11,12}
- Athletic optimization^{13,14}
- Malnutrition¹⁵

Metabolomix+ consists of:

- **Organic Acids** – providing insight into nutritional cofactor needs, digestive issues, cellular energy production, neurotransmitter metabolism, detoxification, **and now oxalates.**
- **Amino Acid Analysis** – features 37 urine amino acids. This assesses nutritionally essential and non-essential amino acids, as well as intermediary metabolites that augment an understanding of B vitamin need, and need for support of protein digestion and absorption.
- **Oxidative Stress Analysis** – highlights the body's current state of oxidative stress and reserve capacity.

Why Use Metabolomix+?

Studies suggest that even a balanced diet may not provide all essential nutrients. Metabolomix + can help to support you and your patients by:

- Identifying nutritional insufficiencies that may be at the root cause of complex chronic conditions
- Providing at-home specimen collection
- Offering an easy-to-use "Interpretation At-A-Glance" that provides patients with valuable information about the function of nutrients, their dietary sources, and the causes and complications of their deficiencies
- Giving insight into potential digestion and absorption abnormalities

The Metabolomix+ report offers functional pillars with a built-in scoring system to guide therapy in a systems-based fashion. The report also contains dynamic biochemical pathway charts for clearer understanding

• Add-on Components

- Bloodspot Essential Metabolic Fatty Acids
- Urine Nutrient & Toxic Elements
- Genomic SNPs



FATIGUE



MOOD DISORDERS



WEIGHT ISSUES

● Results Overview



63 Zillicoa Street
Asheville, NC 28801
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Patient: SAMPLE
PATIENT

DOB:
Sex:
MRN:

3200 Metabolomix+ - FMV Urine



Results Overview



Functional Imbalance Scores

Key 0-4 : Minimal Need for Support 5-7 : Moderate Need for Support 8-10 : High Need for Support

Need for Antioxidant Support	Need for Mitochondrial Support	Need for Reduced Exposure	Need for Methylation Support
<p>Oxidative Stress</p> <div style="font-size: 2em; font-weight: bold; border: 2px solid green; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">4</div>	<p>Mitochondrial Dysfunction</p> <div style="font-size: 2em; font-weight: bold; border: 2px solid yellow; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">7</div>	<p>Toxic Exposure</p> <div style="font-size: 2em; font-weight: bold; border: 2px solid red; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">8</div>	<p>Methylation Imbalance</p> <div style="font-size: 2em; font-weight: bold; border: 2px solid green; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">2</div>
<ul style="list-style-type: none"> Cystine ● Cysteine ● Lipid Peroxides ● 8-OHdG ● Taurine ▲ Citric Acid ▲ cis-Aconitic Acid ● 	<ul style="list-style-type: none"> FIGLU ● Methylmalonic Acid ● Glutaric Acid ▲ Lactic Acid ● Pyruvic Acid ▼ Citric Acid ▲ cis-Aconitic Acid ● Isocitric Acid ▲ α-Ketoglutaric Acid ▲ Succinic Acid ▲ Malic Acid ▲ Adipic Acid ▲ Suberic Acid ▲ 	<ul style="list-style-type: none"> α-Hydroxyisobutyric Acid ▲ α-Ketophenylacetic Acid ▲ Pyroglutamic Acid ▲ Orotic Acid ● Citric Acid ▲ cis-Aconitic Acid ● Isocitric Acid ▲ Glutaric Acid ▲ 	<ul style="list-style-type: none"> Methylmalonic Acid ● Methionine ● FIGLU ● Sarcosine ● Vanilmandelic Acid ● Arginine ▼ Glycine ● Serine ● Creatinine ●

Suggested Supplement Schedule



Nutrient Need Overview

	Nutrient Need										DRI	Suggested Recommendations	Provider Recommendations
	0	1	2	3	4	5	6	7	8	9			
Antioxidants													
Vitamin A											2,333 IU	3,000 IU	
Vitamin C											75 mg	250 mg	
Vitamin E / Tocopherols											22 IU	100 IU	
α-Lipoic Acid												100 mg	
CoQ10												60 mg	
Glutathione													
Plant-based Antioxidants													
B-Vitamins													
Thiamin - B1											1.1 mg	25 mg	
Riboflavin - B2											1.1 mg	50 mg	
Niacin - B3											14 mg	50 mg	
Pyridoxine - B6											1.5 mg	25 mg	
Biotin - B7											30 mcg	400 mcg	
Folic Acid - B9											400 mcg	400 mcg	
Cobalamin - B12											2.4 mcg	100 mcg	
Minerals													
Magnesium											320 mg	800 mg	
Manganese											1.8 mg	3.0 mg	
Molybdenum											45 mcg	75 mcg	
Zinc											8 mg	10 mg	
GI Support													
Digestive Support/Enzymes												0 IU	
Microbiome Support/Probiotics												10 billion CFU	

Amino Acids (mg/day)

Arginine	1,314	Methionine	0
Asparagine	0	Phenylalanine	0
Cysteine	0	Serine	0
Glutamine	89	Taurine	0
Glycine	0	Threonine	0
Histidine	0	Tryptophan	0
Isoleucine	0	Tyrosine	0
Leucine	0	Valine	0
Lysine	74		

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 Nutrient Need Overview 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.



Interpretation At-A-Glance

Antioxidant Needs

Vitamin A



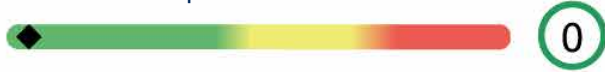
- Beta-carotene & other carotenoids are converted to vitamin A (retinol), involved in vision, antioxidant & immune function, gene expression & cell growth.
- Vitamin A deficiency may occur with chronic alcoholism, zinc deficiency, hypothyroidism, or oral contraceptives containing estrogen & progesterin.
- 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.).

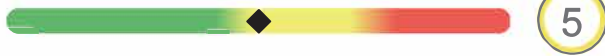
KEY

- Function of Nutrient
- Cause of Deficiency
- Complications of Deficiency
- Food Sources of Nutrient

Interpretation At-A-Glance

B-Vitamin Needs

Thiamin - B1



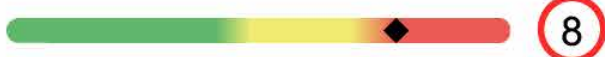
- B1 is a required cofactor for enzymes involved in energy production from food, and for the synthesis of ATP, GTP, DNA, RNA and NADPH.
- Low B1 can result from chronic alcoholism, diuretics, digoxin, oral contraceptives and HRT, or large amounts of tea & coffee (contain anti-B1 factors).
- B1 deficiency 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.

Riboflavin - B2



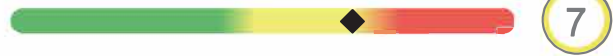
- B2 is a key component of enzymes involved in antioxidant function, energy production, detoxification, methionine metabolism and vitamin activation.
- Low B2 may result from chronic alcoholism, some anti-psychotic medications, oral contraceptives, tricyclic antidepressants, quinacrine or adriamycin.
- 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.

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.

Pyridoxine - B6



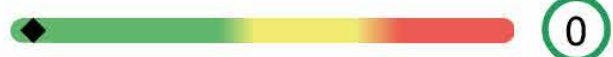
- B6 (as P5P) is a cofactor for enzymes involved in glycogenolysis & gluconeogenesis, and synthesis of neurotransmitters, heme, B3, RBCs and nucleic acids.
- Low B6 may result from chronic alcoholism, long-term diuretics, estrogens (oral contraceptives and HRT), anti-TB meds, penicillamine, L-DOPA or 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.

Biotin - B7



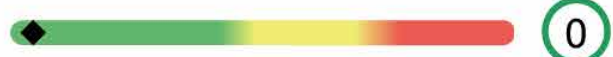
- Biotin is a cofactor for enzymes involved in functions such as fatty acid synthesis, mitochondrial FA oxidation, gluconeogenesis and DNA replication & transcription.
- Deficiency may result from certain inborn errors, chronic intake of raw egg whites, long-term TPN, anticonvulsants, high-dose B5, sulfa 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.

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.

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Interpretation At-A-Glance

Mineral Needs

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.

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.

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.

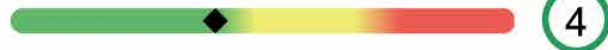
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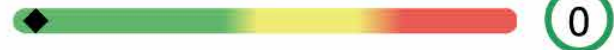
Microbiome & Digestive Support

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.

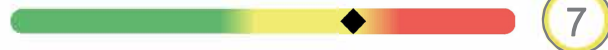
Need for Pancreatic Enzymes



- 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.

Functional Imbalances

Mitochondrial Dysfunction



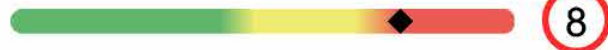
- Mitochondria are a primary site of generation of reactive oxygen species. Oxidative damage is considered an important factor in decline of physiologic function that occurs with aging and stress.
- Mitochondrial defects have been identified in cardiovascular disease, fatigue syndromes, neurologic disorders 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



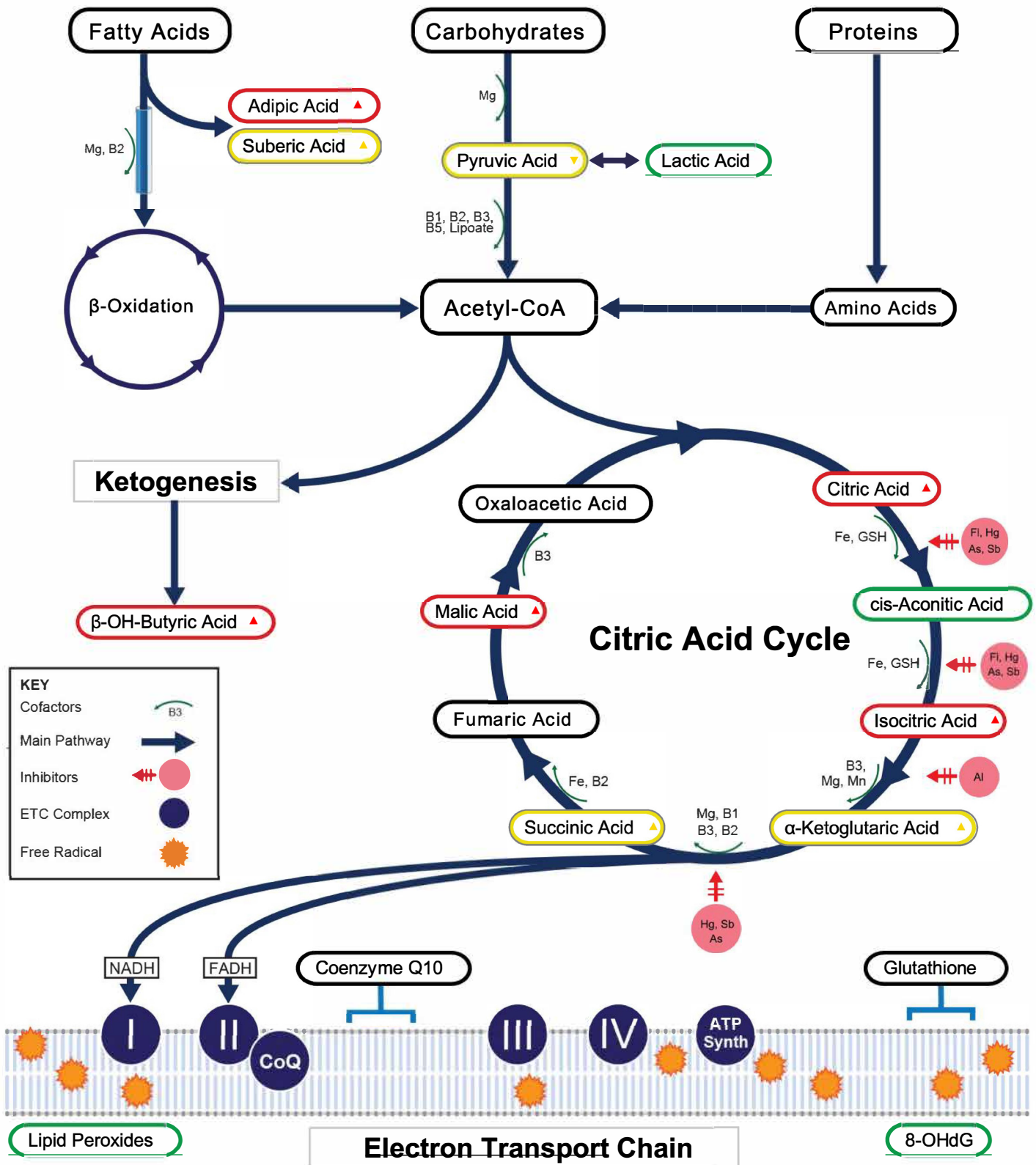
- Methyl tert-Butyl Ether (MTBE) is a common gasoline additive used to increase octane ratings, and has been found to contaminate ground water supplies where gasoline is stored. Inhalation of MTBE may cause nose and throat irritation, as well as headaches, nausea, dizziness and mental confusion. Animal 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.

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Oxidative Stress & Mitochondrial Dysfunction



Organic Acids

Malabsorption & Dysbiosis Markers		Vitamin Markers	
Malabsorption Markers		Branch-Chain Catabolites (B1, B2, B3, ALA)	
	Reference Range		Reference Range
Indoleacetic Acid	1.9	α-Ketoadipic Acid	0.7
Phenylacetic Acid	0.09	α-Ketoisovaleric Acid	0.43
	<= 4.2	α-Ketoisocaproic Acid	0.47
	<= 0.12	α-Keto-β-Methylvaleric Acid	1.8
Dysbiosis Markers		Glutaric Acid	0.33
Dihydroxyphenylpropionic Acid (DHPPA)	2.6	Isovalerylglycine	2.4
3-Hydroxyphenylacetic Acid	3.1		<= 3.7
4-Hydroxyphenylacetic Acid	7		
Benzoic Acid	0.04		
Hippuric Acid	<dl		
	<= 603	Methylation Markers (Folate, B12)	
		Formiminoglutamic Acid (FIGlu)	1.1
		Methylmalonic Acid	0.8
			<= 1.9
Yeast / Fungal Dysbiosis Markers		Biotin Markers	
D-Arabinitol	4	3-Hydroxypropionic Acid	14
Citramalic Acid	15.5	3-Hydroxyisovaleric Acid	19
Tartaric Acid	<dl		<= 29
	<= 15		
Cellular Energy & Mitochondrial Markers		Neurotransmitter Metabolites	
Fatty Acid Metabolism		Kynurenine Markers (Vitamin B6)	
	Reference Range		Reference Range
Adipic Acid	4.2	Kynurenic Acid	13.1
Suberic Acid	1.4	Quinolinic Acid	7.7
	<= 2.8	Kynurenic / Quinolinic Ratio	1.70
	<= 2.1	Xanthurenic Acid	0.56
			<= 0.96
Carbohydrate Metabolism		Catecholamine Markers	
Pyruvic Acid	9	Homovanillic Acid	2.8
Lactic Acid	9.0	Vanilmandelic Acid	1.8
	7-32	3-Methyl-4-OH-phenylglycol	0.09
α-Hydroxybutyric Acid	11.08		0.02-0.22
β-OH-Butyric Acid	>31.0		
β-OH-β-Methylglutaric Acid	12		
	<= 0.83		
	<= 2.8		
	<= 15		
Energy Metabolism		Serotonin Markers	
Citric Acid	998	5-OH-indoleacetic Acid	9.3
cis-Aconitic Acid	23		3.8-12.1
Isocitric Acid	93		
α-Ketoglutaric Acid	34		
Succinic Acid	3.6		
Malic Acid	9.0		
	40-520		
	10-36		
	22-65		
	4-52		
	0.4-4.6		
	<= 3.0		
		Toxin & Detoxification Markers	
			Reference Range
		Pyroglutamic Acid	37
		α-Ketophenylacetic Acid (from Styrene)	0.44
		α-Hydroxyisobutyric Acid (from MTBE)	11.1
		Orotic Acid	0.62
			16-34
			<= 0.46
			<= 6.7
			0.33-1.01

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

Metabolic Analysis Reference Ranges are Age Specific



Organic Acids

Oxalate Markers	Reference Range	Creatinine Concentration	Reference Range
Glyceric Acid	13.8	6.2	3.1-19.5 mmol/L
Glycolic Acid	30		
Oxalic Acid	33		

Reference Ranges:
 Glyceric Acid: 3.5-16.4
 Glycolic Acid: ≤ 67
 Oxalic Acid: ≤ 78

All biomarkers reported in mmol/mol creatinine.

Oxidative Stress Markers

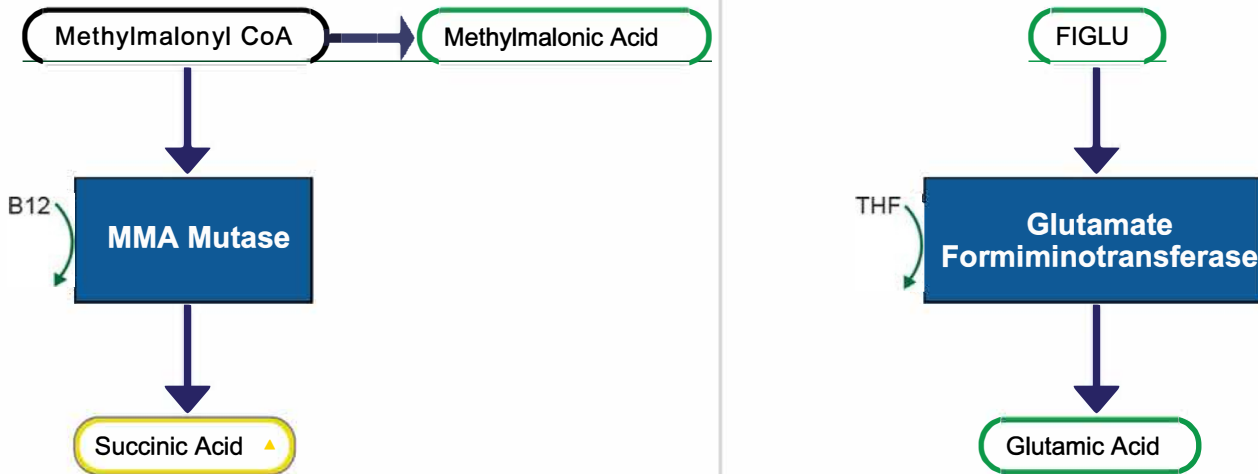
Oxidative Damage	Reference Range
Lipid Peroxides (urine)	5.8
8-OHdG (urine)	4

Reference Ranges:
 Lipid Peroxides (urine): ≤ 10.0 micromol/g Creat.
 8-OHdG (urine): ≤ 15 mcg/g Creat.

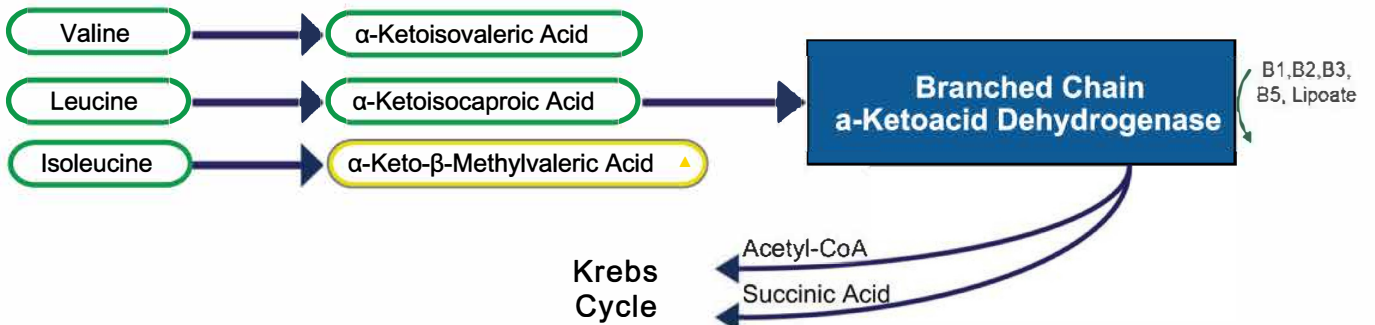
The Oxidative Stress reference ranges are based on an adult population.

Pathways

Methylation Markers



Branch-Chain Amino Acid Metabolism



Amino Acids (FMV)

Nutritionally Essential Amino Acids			Intermediary Metabolites		
Amino Acid		Reference Range	B-Vitamin Markers		Reference Range
Arginine	<dl	3-43	α-Amino adipic Acid	16	2-47
Histidine	361	124-894	α-Amino-N-butyric Acid	14	2-25
Isoleucine	11	3-28	β-Aminoisobutyric Acid	149	11-160
Leucine	22	4-46	Cystathionine	3	2-68
Lysine	36	11-175	Urea Cycle Markers		
Methionine	5	2-18	Citrulline	2,3	0.6-3.9
Phenylalanine	25	8-71	Ornithine	8	2-21
Taurine	266	21-424	Urea ♦	227	168-465 mmol/g creatinine
Threonine	78	17-135	Glycine/Serine Metabolites		
Tryptophan	23	5-53	Glycine	250	95-683
Valine	32	7-49	Serine	132	40-163

Nonessential Protein Amino Acids

Amino Acid		Reference Range
Alanine	41	63-356
Asparagine	88	25-166
Aspartic Acid	<dl	<= 14
Cysteine	26	8-74
Cystine	25	10-104
γ-Aminobutyric Acid	1	<= 5
Glutamic Acid	15	4-27
Glutamine	188	110-632
Proline	3	1-13
Tyrosine	44	11-135

Creatinine Concentration

		Reference Range
Creatinine ♦	6.1	3.1-19.5 mmol/L

Intermediary Metabolites		
B-Vitamin Markers		Reference Range
α-Amino adipic Acid	16	2-47
α-Amino-N-butyric Acid	14	2-25
β-Aminoisobutyric Acid	149	11-160
Cystathionine	3	2-68
Urea Cycle Markers		
Citrulline	2,3	0.6-3.9
Ornithine	8	2-21
Urea ♦	227	168-465 mmol/g creatinine
Glycine/Serine Metabolites		
Glycine	250	95-683
Serine	132	40-163
Ethanolamine	190	50-235
Phosphoethanolamine	4	1-13
Phosphoserine	<dl	3-13
Sarcosine	1.1	<= 1.1

Dietary Peptide Related Markers		
		Reference Range
Anserine (dipeptide)	0.4	0.4-105.1
Carnosine (dipeptide)	3	1-28
1-Methylhistidine	12	38-988
3-Methylhistidine	38	44-281
β-Alanine	4	<= 22

Amino Acid reference ranges are age specific.

Methodology: LC/MS/MS, Alkaline Picrate



Metabolomix+ PROFILE

Analytes reported		Analytes reported		Analytes reported		Analytes reported		Analytes reported	
Organic Acids		Organic Acids		Amino Acids		Add-on Fatty Acids		Add-on Elements	
Malabsorption and Dysbiosis		Vitamin Markers		Creatinine Concentration		Saturated Fatty Acids		Nutrient Elements*	
Malabsorption Markers		a-Ketoadipic Acid	•	Creatinine	•	Behenic Acid	•	Chromium*	•
Indoleacetic Acid (AA)	•	a-Ketoisovaleric Acid	•	Intermediary Metabolites		Tricosanoic Acid	•	Cobalt*	•
Phenylacetic Acid (PAA)	•	a-Ketoisocaproic Acid	•	B Vitamin Markers		Lignoceric Acid	•	Copper*	•
Bacterial Dysbiosis Markers		a-Keto-β-Methylvaleric Acid	•	α-Amino adipic Acid	•	Pentadecanoic Acid	•	Iron*	•
Dihydroxyphenylpropionic Acid	•	Formiminoglutamic Acid	•	α-Amino-N-Butyric Acid	•	Margaric Acid	•	Lithium*	•
3-Hydroxypropionic Acid	•	Glutaric Acid	•	Urea Cycle Markers		% Saturated Fats	•	Manganese*	•
4-Hydroxyphenylpyruvic Acid	•	Isovalerylglycine	•	Citrulline	•	Omega 6 Fatty Acids		Molybdenum*	•
Benzoic Acid	•	Methylmalonic Acid	•	Ornithine	•	Linoleic Acid	•	Selenium*	•
Hippuric Acid	•	Xanthurenic Acid	•	Urea	•	γ-Linolenic Acid	•	Strontium*	•
Yeast/Fungal Dysbiosis Markers		3-Hydroxypropionic Acid	•	Glycine/Serine Metabolites		Dihomo-γ-linolenic Acid	•	Vanadium*	•
D-Arabinitol	•	3-Hydroxyisovaleric Acid	•	Glycine	•	Arachidonic	•	Zinc*	•
Citramalic Acid	•	Toxin and Detoxification Markers		Serine	•	Docosatetraenoic Acid	•	Calcium*	•
Tartaric Acid	•	a-Ketophenylacetic Acid	•	Ethanolamine	•	Eicosadienoic Acid	•	Magnesium*	•
Cellular Energy and Mitochondrial Metabolites		a-Hydroxyisobutyric Acid	•	Phenylalanine	•	% Omega 6s	•	Potassium*	•
Carbohydrate Metabolism		Orotic Acid	•	Phosphoethanolamine	•	Monounsaturated Fats		Sulfur	•
Lactic Acid	•	Pyroglutamic Acid	•	Phosphoserine	•	Omega 7 Fats		Toxic Elements	
Pyruvic Acid	•	Oxalates		Sarcosine	•	Palmitoleic Acid	•	Lead	•
α-Hydroxybutyric Acid	•	Glyceric Acid	•	Dietary Peptide		Vaccenic Acid	•	Mercury	•
β-Hydroxybutyric Acid	•	Glycolic Acid	•	Anserine	•	Trans Fat		Aluminium	•
Energy Metabolism		Oxalic Acid	•	Carnosine	•	Elaidic Acid	•	Antimony	•
Citric Acid	•	Amino Acids		1-Methylhistidine	•	Delta - 6 Desaturase Activity		Arsenic	•
cis-Aconitic Acid	•	Nutritionally Essential Amino Acids		3-Methylhistidine	•	Linoleic/DGLA ratio	•	Barium	•
Isocitric Acid	•	Arginine	•	β-Alanine	•	Add-on Genomic Markers		Bismuth	•
α-Ketoglutaric Acid (AKG)	•	Histidine	•	Oxidative Stress		APO E (C112R + R158C)	•	Cadmium	•
Succinic Acid	•	Isoleucine	•	Lipid Peroxides (urine)	•	COMT (V158M)	•	Cesium	•
Malic Acid	•	Leucine	•	8-OHdG (urine)	•	MTHFR Combined	•	Gadolinium	•
β-OH-β-Methylglutaric Acid (HMG)	•	Lysine	•	Add-on Fatty Acids		TNFA	•	Nickel	•
Fatty Acid Metabolism		Methionine	•	Omega 3 Fatty Acids				Niobium	•
Adipic Acid	•	Phenylalanine	•	α-Linolenic Acid	•			Platinum	•
Suberic Acid	•	Taurine	•	Eicosapentaenoic Acid	•			Rubidium	•
Creatinine Concentration		Threonine	•	Docosapentaenoic Acid	•			Thallium	•
Creatinine	•	Tryptophan	•	Docosahexaenoic Acid	•			Thorium	•
Neurotransmitter Metabolism Markers		Valine	•	% Omega 3s	•			Tin	•
Vanilmandelic Acid	•	Nonessential Protein Amino Acids		Omega 9 Fatty Acids				Tungsten	•
Homovanillic Acid	•	Alanine	•	Oleic Acid	•			Uranium	•
5-OH-indoleacetic Acid	•	Asparagine	•	Nervonic Acid	•				
3-Methyl-4-OH-phenylglycol	•	Aspartic Acid	•	% Omega 9s	•				
Kynurenic Acid	•	Cysteine	•	Saturated Fatty Acids					
Quinolinic Acid	•	Cystine	•	Palmitic Acid	•				
Kynurenic / Quinolinic Ratio	•	Gamma-Aminobutyric Acid	•	Stearic Acid	•				
		Glutamic Acid	•	Arachidic Acid	•				
		Glutamine	•						
		Proline	•						
		Tyrosine	•						

*NUTRIENT ELEMENTS AVAILABLE ONLY IF ADD-ON COMPREHENSIVE URINE ELEMENT PROFILE #3203 IS ORDERED

Turnaround times, sample reports, and additional information is available online at www.gdx.net



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Metabolomix+

BEFORE YOU BEGIN:

There are multiple samples requested for this testing and you will notice multiple collection containers. This page is designed to provide a high level overview of the collection process and requirements while each bag will contain very specific and detailed instructions.

IMPORTANT THINGS TO KNOW AND CONSIDER

- **Testing is not available for patients less than 2 years old**
- **Female patients should not collect during menstrual period**

2 Days before the test

- **Discontinue** all of the following (unless instructed otherwise by your physician):
 - » **Supplements containing creatine, vitamin C or any mineral elements** measured on this test
 - » **Other substances that may influence urinary element excretion of elements**
 - » **Seafood** (unless asked to continue by your healthcare provider)
 - » **Continue** with the above food restrictions until your sample is completely collected

24 hrs before the test:

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

BAG ONE contains the collection instructions supplies needed to collect a **Blood Spot Essential & Metabolic Fatty Acid Profile**

(note this may or may not be requested by your Health Care Provider, please see requisition form to determine if this collection is necessary. This is typically collected the morning of Day 1 and requires an 8 hour fast)

BAG TWO contains the collection instructions and supplies needed to collect urine specimens for a **Metabolomix+**

*(note this requires an 8 hour fast and is typically collected the morning of Day 2) as well as collection instructions and supplies needed to collect a **buccal swab for genetic markers** (note this may or not be requested by your Health Care Provider, please see requisition form to determine if this collection is necessary. This is also typically collected the morning of Day 2)*



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

ENSURE THE FOLLOWING:

- Labels completed with patient's date of birth are on all tubes as well as the test requisition form

All tubes:

- Are tightly closed
- Sealed in the biohazard bag with absorbent pad
- Frozen until packaged for shipping

Swabs (ONLY FOR GENOMICS ADD-ONS):

- Swabs in the package and in the envelope

All required information:

Can be completed online or using included paper forms

- All sections of test requisition form completed
- Payment information provided

- All tubes and associated forms placed back in the original Genova sample collection pack box prior to shipping

SHIP THE SAMPLE(S) TO THE LAB

Ship only Monday through Friday, and within 24 hours after final collection.

Please refer to the shipping instruction insert found in your Genova sample collection pack box.



REGISTER FOR THE PATIENT RESOURCE CENTER AT WWW.GDX.NET/PRC

- Complete health surveys
- Make payments
- Access test results



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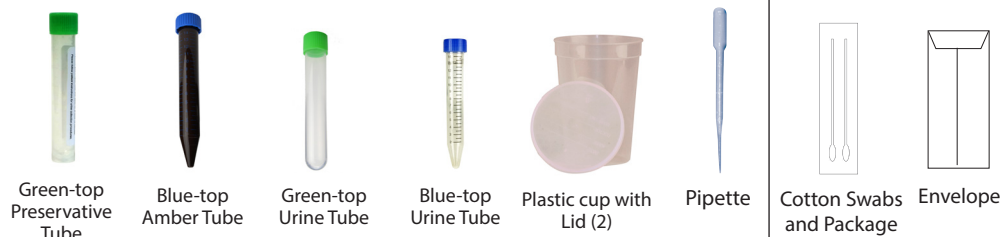
Metabolomix+ BAG TWO COLLECTION

PATIENT SAMPLE COLLECTION INSTRUCTIONS FOR THE FOLLOWING PROFILE(S)

Metabolomix+*	Urine	#3200
Add-on Toxic Clearance Profile*	Urine	#3203
Add-on Comprehensive Urine Elements*	Urine	#3204
Add -on SNP - APO E (C112R + R158C)	Buccal Swab	#5204
Add -on SNP - MTHFR Combined (A1298C + C677T)	Buccal Swab	#5201
Add -on SNP - TNFA	Buccal Swab	#5203
Add -on SNP - COMT (V158M)	Buccal Swab	#5202

BAG TWO COLLECTION MATERIALS FOR SAMPLE

COLLECTION MATERIALS FOR URINE



REQUIRED MATERIALS

- Foam Insulator box
- Freezer brick
- Absorbent pad
- Test requisition form
- Biohazard bag
- Genova sample collection pack box
- FedEx® Clinical Lab Pak and Billable Stamp
- Collection labels (5)

IMPORTANT INFORMATION BEFORE YOU BEGIN THE URINE AND SALIVA COLLECTION

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) 8-ounce glasses of fluid over a 24 hour period

NIGHT BEFORE THE TEST:

- **You must fast** overnight prior to your urine/swab collection
- **Females** should not collect urine during a menstrual period
- **Freeze** the enclosed freezer brick overnight before shipping.
- Please note, patients **may not** be treated with provocation agent for purposes of testing.

Urine Tube Preservative

- **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.

SALIVA COLLECTION (ONLY FOR GENOMICS ADD-ON TESTING)

NIGHT BEFORE THE TEST:

- **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

URINE COLLECTION

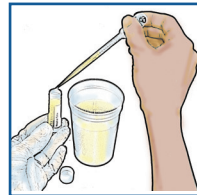
- 1 **Label all tubes with the patient's date of birth. Do not discard tube fluid.**

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

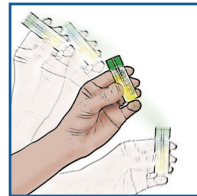
- 3 **If you wake up to urinate during the night** (within six hours of waking) **collect** that urine into one of the provided urine cups (3/4 full), place lid on cup then refrigerate. **Upon waking, collect** your urine into the second urine cup (3/4 full), and pass any additional urine into the toilet. **Mix** the two urine collections back and forth between the 2 cups to achieve a uniform mixture.



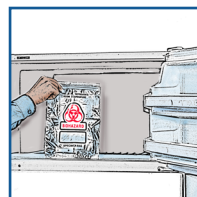
- 4 **Use** the pipette to transfer urine from the collection container into the Green-top Preservative Tube, Blue-top Urine Tube, Blue-top Amber Tube, and Green-top Urine Tube until all are nearly full.



- 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**.

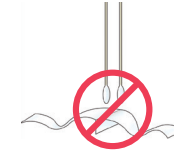


SALIVA COLLECTION (ONLY FOR GENOMICS ADD-ON TESTING)



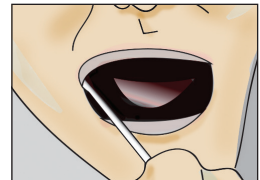
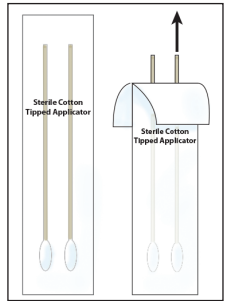
- 1 **Keeping the packet intact, peel** open the package labeled, "Sterile Cotton Tipped Applicator."
Only peel back the package far enough to remove the cotton swab applicator.

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



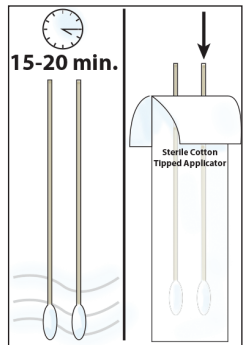
- 3 **Open** your mouth widely and insert applicator. For at least 30 seconds, **aggressively scrape** the inside of your cheek using a back and forth, and up and down motion. **Rotate** the applicator several times, and **swab** between the cheek and gums. Avoid excessive saliva.

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.



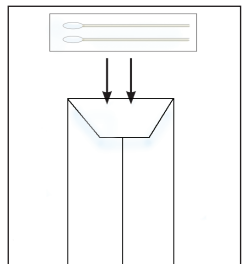
- 4 **REPEAT FIGURES 2 - 3 WITH SECOND SWAB**

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



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

- 7 **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.



ENSURE THE FOLLOWING:

Blood spot card

- First and last name and date of collection are written on the bloodspot card
- Placed in resealable plastic bag with desiccant/moisture absorbent pack
- Completely dried (apprx 24 hours)

All required information:

Can be completed online or using included paper forms

- All sections of **test requisition form** completed
- Payment information provided**
- All tubes, the card, and associated forms** placed back in the original Genova sample collection pack box prior to shipping

SHIP THE SAMPLE(S) TO THE LAB

Ship only Monday through Friday, and within 24 hours after final collection.

Please refer to the shipping instruction insert found in your Genova sample collection pack box.



REGISTER FOR THE PATIENT RESOURCE CENTER AT WWW.GDX.NET/PRC

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- Access test results



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Metabolomix+ BAG ONE COLLECTION



PATIENT SAMPLE COLLECTION INSTRUCTIONS FOR THE FOLLOWING PROFILE

Metabolomix+ *

Add-on Bloodspot Essential & Metabolic Fatty Acids*

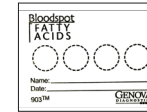
Bloodspot

#3202

BAG ONE COLLECTION MATERIALS FOR SAMPLE



Lancets (2)



Bloodspot card

REQUIRED MATERIALS

- Alcohol prep pad (2)
- Adhesive bandage
- Absorbent pad
- Resealable plastic bag with desiccant/moisture absorbent pack
- Genova sample collection pack box
- FedEx® Clinical Lab Pak and Billable Stamp

IMPORTANT PREP BEFORE PATIENT TAKES TEST

Night before the test

- Patients must fast overnight prior to collecting the bloodspot

PLEASE READ THE BEFORE YOU BEGIN SHEET INCLUDED BEFORE PROCEEDING TO COLLECTION

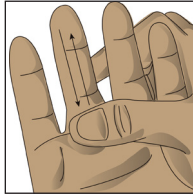
BLOOD SPOT COLLECTION

1 Write **first and last name** and **date of collection** on the blood spot card

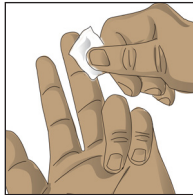
2 **Wash** hands with warm water for a minimum of 20 seconds. **Dry** hands.

To improve circulation;

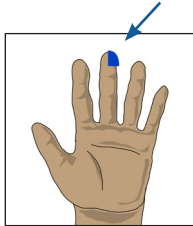
- **Hold** your hand lower than heart level and **gently massage** the entire length the middle finger for 30 seconds.
- Firmly **grasp** the top knuckle of the middle finger for a few seconds to restrict return circulation.
- **Hang** arm down and **gently shake** your fingers a few seconds to increase blood pools in the finger.



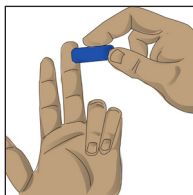
3 **Clean** the tip of your finger with the alcohol pad.



4 **Remove** the clear cover from the lancet. One end of the lancet has a small hole in the center; this will be the end that you press firmly against your finger to engage the lancet.

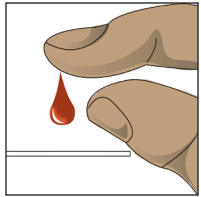


5 **Locate** the appropriate site on the middle fingertip (see image).



6 **Place** the hole-end of the lancet firmly against your fingertip to **depress** the tip and release the lancet. The lancet will immediately retract safely after depression.

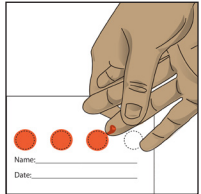
7 Using your thumb, **gently massage** entire length of the pricked finger to form repeated blood drops. As each drop forms, touch the tip of the drop to a circle on the collection card. **Do not smear. Do NOT touch fingertip to card!!**



8 **Repeat** until blood **has soaked to the border of the circle** on the collection card. Continue this procedure for all four circles.

If you are unable to get enough blood from the first collection, repeat this procedure with a different finger.

If necessary, use the absorbent pad to dry the site on your finger after your collection. Use the enclosed adhesive bandage as needed.



9 **Allow** absorbent collection card to air dry overnight, **approximately 24 hours, before placing in the resealable plastic bag** with desiccant/moisture absorbent pack for shipping. **If the card is not completely dry, your sample may be unusable.**

AVOID:	CONFIRM:
Layering blood on a previously dried spot	Blood should saturate through both sides of the card
Smearing blood onto the card	Requisition is properly completed and signed
Touching the surface of the card with fingers	Dried card is in zip lock bag with desiccant
ACCEPTABLE COLLECTION CARD EXAMPLE	UNACCEPTABLE COLLECTION CARD EXAMPLE:
