LAB #: 999999-9999
PATIENT: Sample Patient
ID: 99999999
SEX: Female
DOB: 01/01/1960 **AGE: 63**

Amino Acids; Urine

ESSENTIAL / CONDITIONALLY INDISPENSABLE AMINO ACIDS	RESULT µmol/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Methionine	**0.86**	8– 48	
Lysine	**110**	40– 530	
Threonine	**5.6**	56– 320	
Leucine	**1.5**	8– 80	
Isoleucine	**1.1**	5– 30	
Valine	**15**	15– 70	
Phenylalanine	**30**	25– 100	
Tryptophan	**39**	20– 100	
Taurine	**1780**	220– 1300	
Cysteine	**18**	25– 73	
Arginine	**17**	8– 55	
Histidine	**200**	350– 1700	

NONESSENTIAL AMINO ACIDS	RESULT µmol/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Alanine	**250**	130– 600	
Aspartate	**6.6**	6– 33	
Asparagine	**32**	35– 200	
Glutamine	**200**	155– 650	
Glutamate	**31**	10– 52	
Cystine	**44**	30– 105	
Glycine	**1340**	350– 3500	
Tyrosine	**63**	28– 120	
Serine	**80**	125– 560	
Proline	**10**	1– 55	

SPECIMEN DATA

Comments:

Date Collected: **08/31/2023**
Date Received: **09/02/2023**
Date Reported: **09/07/2023**

Collection Period: **Random**
Volume:

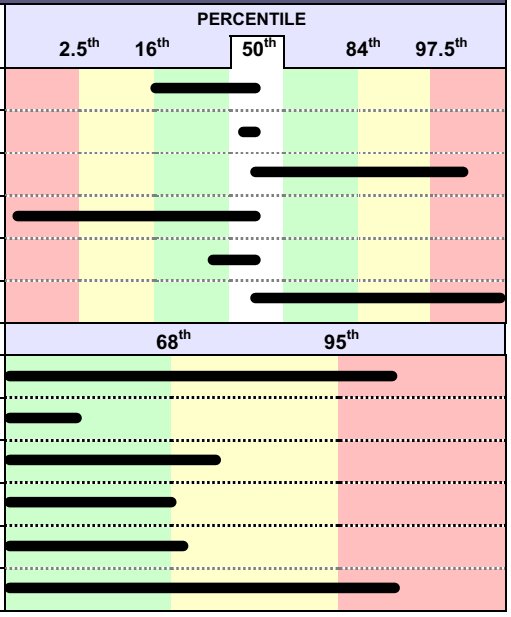
Methodology: **LC MS/MS**
NH_4, Urea, Creatinine by Automated Chem Analyzer

v3

PATIENT: Sample Patient
LAB#: 999999-9999
DATE COLLECTED: 08/31/2023
PAGE: 2

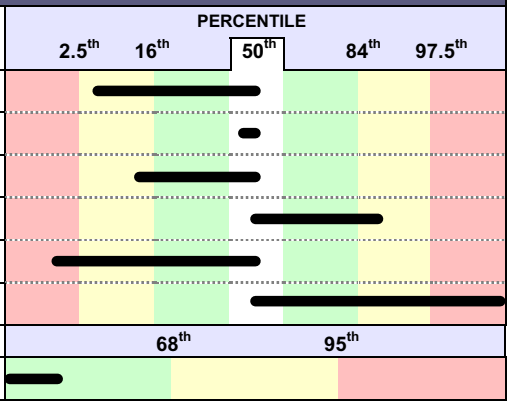
GASTROINTESTINAL MARKERS

	RESULT µmol/g creatinine	REFERENCE INTERVAL
Ammonia (NH_4)	**17800**	12000– 49000
Ethanolamine	**260**	120– 440
Alpha-Aminoadipitate	**79**	6– 72
Threonine	**5.6**	56– 320
Tryptophan	**39**	20– 100
Taurine	**1780**	220– 1300
Beta-alanine	**37**	< 20
Beta-aminoisobutyrate	**47**	< 380
Anserine	**42**	< 95
Carnosine	**16**	< 50
Gamma-aminobutyrate	**3.4**	< 7
Hydroxyproline	**61**	< 45



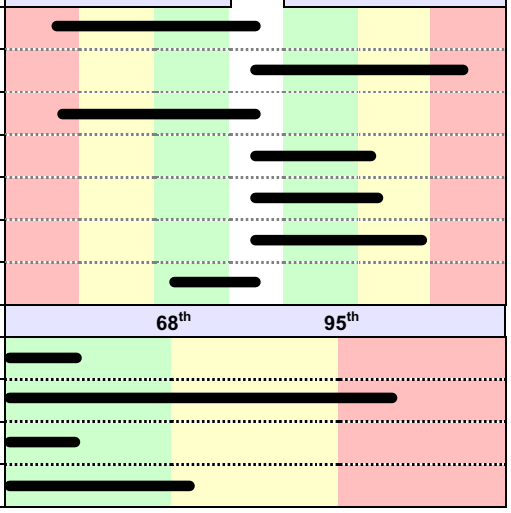
MAGNESIUM DEPENDANT MARKERS

	RESULT µmol/g creatinine	REFERENCE INTERVAL
Citrulline	**1.4**	1– 30
Ethanolamine	**260**	120– 440
Phosphoethanolamine	**26**	20– 75
Phosphoserine	**0.6**	0.05– 0.8
Serine	**80**	125– 560
Taurine	**1780**	220– 1300
Methionine Sulfoxide	**1.6**	< 10



B6, B12, & FOLATE DEPENDANT MARKERS

	RESULT µmol/g creatinine	REFERENCE INTERVAL
Serine	**80**	125– 560
Alpha-aminoadipate	**79**	6– 72
Cysteine	**18**	25– 73
Cystathionine	**31**	8– 50
1-Methylhistidine	**240**	70– 280
3-Methylhistidine	**1070**	55– 1100
Alpha-amino-N-butyrate	**17**	5– 72
Beta-aminoisobutyrate	**47**	< 380
Beta-alanine	**37**	< 20
Homocystine	**0.22**	< 1
Sarcosine	**3.1**	< 10



DETOXIFICATION MARKERS

	RESULT µmol/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Methionine	**0.86**	8– 48	
Cysteine	**18**	25– 73	
Taurine	**1780**	220– 1300	
Glutamine	**200**	155– 650	
Glycine	**1340**	350– 3500	
Aspartate	**6.6**	6– 33	

NEUROLOGICAL MARKERS

	RESULT µmol/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Ammonia (NH_4)	**17800**	12000– 49000	
Glutamine	**200**	155– 650	
Phenylalanine	**30**	25– 100	
Tyrosine	**63**	28– 120	
Tryptophan	**39**	20– 100	
Taurine	**1780**	220– 1300	
Cystathionine	**31**	8– 50	
			68th 95th
Beta-alanine	**37**	< 20	

UREA CYCLE METABOLITES

	RESULT per creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Arginine	**17 µmol/g**	8– 55	
Aspartate	**6.6 µmol/g**	6– 33	
Citrulline	**1.4 µmol/g**	1– 30	
Ornithine	**18 µmol/g**	3– 45	
Urea	**560 mmol/g**	150– 590	
Ammonia (NH_4)	**17800 µmol/g**	12000– 49000	
Glutamine	**200 µmol/g**	155– 650	
Asparagine	**32 µmol/g**	35– 200	

OTHER

	RESULT	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Creatinine	**57 mg/dL**	30– 225	

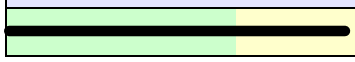
SUPPLEMENTATION SCHEDULE

L-configured Amino Acids	Total Daily Oral Dose
Tryptophan	**185 mg**
Arginine	**585 mg**
Histidine	**895 mg**
Isoleucine	**1200 mg**
Leucine	**1690 mg**
Lysine	**585 mg**
Methionine	**1060 mg**
Phenylalanine	**935 mg**
Threonine	**1015 mg**
Valine	**1160 mg**
Pyridoxal-5-phosphate	**30 mg**
Alpha-ketoglutarate	**650 mg**
Taurine	**0 mg**

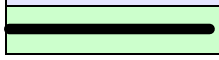
The supplement schedule is not intended for use by pregnant females and is strictly contraindicated for individuals with suspected or known renal insufficiency or renal failure.

PRESUMPTIVE NEEDS / IMPLIED CONDITIONS

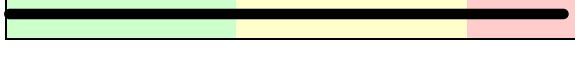
NEED FOR VITAMIN B6



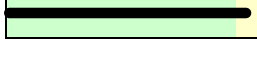
NEED FOR FOLATE, VITAMIN B12



NEED FOR MAGNESIUM



SUSCEPTIBILITY TO VASCULAR DISEASE



ABNORMAL INTESTINAL MICROFLORA

MALDIGESTION / MALABSORPTION

IMPAIRED DETOXIFICATION

NEUROLOGICAL DISORDERS

NITROGEN INSUFFICIENCY

EXCESSIVE PROTEIN

OXIDATIVE STRESS

This recommended Amino Acid Supplement Schedule was calculated based upon the difference between the test results for this specific patient and optimal urine levels, and guidelines for human amino acid requirements as provided by the Food and Nutrition Board of the NRC. The schedule has been provided at the request of a licensed medical practitioner and the calculated levels of amino acids only apply to ORAL administration. The supplement schedule is not intended for use by pregnant females and is strictly contraindicated for individuals with suspected or known renal insufficiency or renal failure.

Only pure, L-form crystalline amino acids should be used and the custom formulation should be prepared by credible pharmacies or purveyors who specialize in amino acid formulations. In order to get the full benefit of the amino acid supplementation, one needs to ensure adequate intake of CALORIES and the essential co-factors that permit proper metabolism of the amino acids (eg. B-6, B-12, folate, magnesium). Supplemental cystine or N-acetylcysteine should not be given to patients who have been diagnosed with intestinal candidiasis.

This analysis of amino acids and related metabolites was performed using High Pressure Liquid Chromatography. The test provides fundamental information about the adequacy of dietary protein, digestive disorders, dysbiosis, mood and sleep disorders, and vitamin and mineral deficiencies. When the level of a specific amino acid or metabolite deviates significantly from the norm, an interpretive paragraph is presented which briefly discusses the possible causes, clinical implications and remedies for the metabolic aberrations. If no significant abnormalities are detected, interpretive paragraphs and amino acid supplementation schedules are not provided.

”Presumptive Needs” are not the result of direct analyses of B vitamins or magnesium but are based upon algorithms that utilize levels of specific amino acids (AA) and intermediary metabolites that may be abnormal if nutrient cofactors limit normal AA metabolism. Direct testing for B vitamins and magnesium (Red Blood Cell Elements) may be warranted. ”Implied conditions” may infer further clinical evaluation, functional testing and direct laboratory testing (e.g. Comprehensive Stool Analysis, Cardiovascular Risk Profile, DNA Oxidative Damage, Methylation Profile).

Creatinine

The urinary creatinine concentration (CC) presented in this report represents the actual creatinine concentration in the specimen that was submitted. Under normal conditions, the rate of excretion of creatinine is quite constant and highly correlated with lean body mass (muscle). However, the CC can vary significantly as a function of urine volume. An unusually high CC most likely indicates poor hydration of the patient at the time of the urine collection. A very low CC most likely indicates unusually high fluid consumption, or perhaps the influence of diuretics. If the urine specimen is very dilute (extremely low CC), the accuracy of the amino acid analysis may be compromised due to analytical detection limits. It is emphasized that the CC in this specimen should not be utilized to assess renal function or glomerular filtration. For that purpose, one should perform a bona fide creatinine clearance test.

Methionine (low)

Methionine, an essential amino acid, is low in this urine specimen. Methionine is a precursor of other important amino acids and metabolites. Cysteine and taurine are derived in part from methionine. Cysteine is the rate limiting amino acid in the endogenous production of glutathione, a predominant amino acid in metallothionein, and is required for the production of Coenzyme A that is involved in fatty acid metabolism and the Krebs cycle. Taurine is an important antioxidant, a component of bile, a neurotransmitter, and very importantly, an osmoregulator that facilitates the intracellular retention of magnesium and potassium. Methionine also serves as a methyl donor (serine, creatine, epinephrine). Methionine deficiency can result in fatty liver and decreased capacity for endogenous detoxification of sulfhydryl reactive metals and xenobiotics. Symptoms that may be associated with insufficient methionine include inflammation, headaches, fatigue, biliary insufficiency, occlusive arterial disease, myopia and skeletal disorders. Animal products, as well as almonds and cashews are a good dietary sources of methionine. Supplementation with methionine should be accompanied with magnesium, B-6, folate and B-12.

Threonine (low)

Threonine, an essential amino acid, is low in this urine specimen. Threonine is the precursor of serine and glycine, and is required in the formation of glycoproteins that are essential in immune function. Threonine is slowly absorbed and is often low as a result of rapid transit time, maldigestion or insufficient quality or quantity of dietary protein. Meats, poultry, fish, some nuts and peanuts and, cheeses are good sources of threonine.

Leucine (low)

Leucine, an essential amino acid, is low in this urine specimen. Leucine is a branched-chain amino acid that is a common constituent of proteins, peptides and hormones. It also promotes wound healing, promotes insulin release from the pancreas, and is component of elastin (ligaments). Low leucine can result from protein malnutrition, zinc deficiency (Zn dependent peptidase), or other gastrointestinal dysfunctions such as hypochlorhydria.

Isoleucine (low)

Isoleucine, an essential amino acid, is low in this urine specimen. Isoleucine is a branched-chain structural amino acid that like leucine and valine is a common component of proteins, peptides and hormones. Leucine is catabolyzed as a source of carbon for energy production during exercise in skeletal muscle. Isoleucine and the other branched chain amino acids can be low as a result of zinc deficiency (zinc dependent intestinal peptidase), protein malnutrition or other gastrointestinal dysfunctions.

Valine (low)

Valine, an essential branched-chain amino acid, is low in this urine specimen. Valine is required for the synthesis of proteins and physiologically active peptides, and like leucine

and isoleucine is critical to muscle function and metabolism. Valine can be low as a result of gastrointestinal dysfunction, zinc deficiency (zinc-dependent intestinal peptidase), or protein malnutrition. Good dietary sources of valine include meats, poultry, cottage cheese, ricotta cheese and nonfat dry milk. Cereals and other cheeses are relatively low in valine.

Taurine (high)

Taurine, a conditionally essential amino acid, is abnormally high in this urine specimen. Elevated urinary taurine is usually associated with impaired renal conservation (wasting) due to competition by elevated levels of B-alanine (check B-alanine). Excessive levels of B-alanine are commonly associated with dysbyosis (bacterial and/or fungal). However, first rule out oral supplementation of taurine. B-alanine could also accumulate and compete for retention of taurine with a frank B-6 deficiency; in such a case one would also expect to see elevations in other amino acids that require transamination (eg. leucine, isoleucine, valine). Urinary wasting of taurine can be associated with low intracellular taurine that can negatively impact on intracellular electrolytes (magnesium, potassium, calcium, sodium). Taurine accounts for about 50% of the free amino acids in cardiac tissue, therefore taurine deficiency can result in arrhythmias. Taurine is also an important antioxidant, neurotransmitter (CNS), and a component of bile acids (fat and fat soluble vitamin absorption). Taurine is a key scavenger of hypochlorite ions, thus a shortage of taurine after viral or bacterial infections, or exposure to xenobiotics (eg. chlorine, chlorite, alcohol, aldehydes) can result in excessive inflammation or chemical sensitivity. It can be futile to simply supplement taurine (or magnesium) without correcting the cause of renal wasting of taurine, therefore a Comprehensive Stool Analysis test may be warranted.

Cysteine (low)

Cysteine, the reduced and reactive form of cystine is low in this urine specimen. Cysteine is required for the formation of coenzyme A, proteins with cross-linked polypeptide chains (eg. insulin), metallothionein, and enzymes with active sulfhydryl (SH-) groups (eg. glutathione peroxidase, Na/ K ATPase). Cysteine is the rate limiting amino acid for the formation of intracellular glutathione, which is one of the most important endogenous antioxidants and detoxifying (metals and chemicals) molecules in the body. Cysteine may be low due to: (1) chronic exposure to sulfhydryl reactive metals (eg. mercury, cadmium, arsenic), or toxic chemicals, (2) oxidative stress or insufficient antioxidants (vitamins E and C), (3) inflammation, (4) methionine insufficiency or impaired methionine metabolism (inadequate folic acid, B-12, B-6, magnesium), or (5) cysteinurea or hypertaurinurea. Supplementation with N-acetyl cysteine may be beneficial except in cystinurea, intestinal candidiasis or insulin-dependent diabetes. Undenatured whey protein and eggs are excellent dietary sources of cysteine.

Histidine (low)

Histidine, a semi essential amino acid, is low in this urine specimen. Histidine is required for maintenance and growth of tissue, transport of copper, and it is the precursor of histamine (vasodilator). Histamine stimulates gastric secretions (HCL) and is necessary for proper digestion of food and assimilation of nutrients. Histidine is commonly low in patients with rheumatoid arthritis. Low histidine may result from protein malnutrition or

gastrointestinal dysfunction.

Asparginine (low)

Asparginine, a nonessential amino acid, is low in this urine specimen. Asparginine is derived from dietary protein, and via synthesis from aspartate and glutamine can minimize accumulation of ammonia in tissues. Asparginine is also required for optimal immune function. Insufficient intake of protein is the most common reason for low urinary asparginine. Check for low levels of essential amino acids and ammonia.

Serine (low)

Serine, a nonessential amino acid, is low in this urine specimen. Serine is plentiful in dietary protein and is also formed endogenously from dietary phosphoserine (magnesium dependent), glycine and threonine. In addition, serine is derived from glycolysis provided that the status of B-6 and magnesium are good. Serine is also required for proper metabolism of methionine; a blatant serine deficiency would be expected to be associated with low cysteine and cystathionine and, homocystinurea (elevated plasma homocysteine). Elevated phosphoserine: serine is a good indicator of functional magnesium insufficiency. Low urinary serine is usually associated with insufficient protein intake or malabsorption or magnesium deficiency.

Alpha-aminoadipate (high)

Alpha-aminoadipic acid (A-AAA), an intermediary metabolite of lysine and tryptophan, is high in this urine specimen. A-AAA results from transamination reactions that require functional B-6 activity. If moderate supplementation with lysine or tryptophan were taken within 48 hours of the urine collection, then the elevated level of A-AAA would likely indicate increased need for functional B-6. The same would be expected if dietary protein intake were excessive during the collection (elevated urine urea would be confirmatory of excessive protein intake). An alternative reason for the elevated A-AAA might be overgrowth or infection by yeast or fungus, organisms that can synthesize lysine and A-AAA. In the later case, a Comprehensive Stool Analysis could be utilized for confirmation of overgrowth of gastrointestinal yeast.

Beta-alanine (high)

Beta-alanine, a nonessential intermediary amino acid, is abnormally elevated in this urine specimen. Normally beta-alanine is near completely deaminated to alpha-ketoglutarate (B-6 dependent). Beta-alanine is derived from: (1) the breakdown of DNA/RNA (yeast, pyrimidine, uracil), (2) activity of unusual bacteria on aspartic acid and, (3) the hydrolysis of anserine and carnosine, which are peptides found in beef, pork, poultry, salmon, and tuna. Elevated beta-alanine inhibits the breakdown of anserine and carnosine, and impairs the renal conservation of taurine and beta-aminoisobutyric acid; taurine is an important antioxidant, neurotransmitter and essential for the retention and homeostasis of intracellular magnesium and potassium. Beta-alanine is a neurotoxic substance that suppresses development in the brain and spinal cord. Beta-alanine also interferes with the metabolism of the neuroinhibitory neurotransmitter gamma-aminobutyric acid. Hyper-B- alaninurea has been associated with seizures and somnolence.Patients exhibiting

elevated urinary B-alanine should be retested after given a trial on a low-protein, low-pyrimidine diet and high B-6 (P-5-P). Elevated levels of B-alanine are highly correlated with gastrointestinal and genitourinary infections in patients with Chronic Fatigue Syndrome. Intestinal dysbiosis, especially candidiasis, should be evaluated via a Comprehensive Stool Analysis.

Hydroxyproline (high)

Hydroxyproline, a nonessential protein forming amino acid, is high in this urine specimen. Consider the trivial dietary cause for this abnormality; high intake of high gelatin (”Jell-O”, candies) or low quality hydrolyzed protein drinks/high protein diet foods. Aside from these sources, hydroxyproline can be high in association with maldigestion of dietary protein and increased uptake of dietary peptides. This may result from gastric or pancreatic dysfunction, and food sensitivities/intolerances may also be present. Otherwise the elevated hydroyproline may be indicative of various disorders in collagen metabolism, bone fractures, extensive bruising, burns, surgery, skin conditions featuring catabolism of tissue, severe acne, arthritis, osteoporosis and osteomalacia.