



LAB #: 999999-9999  
 PATIENT: Sample Patient  
 ID: 99999999  
 SEX:  
 DOB:

CLIENT #: 999999  
 DOCTOR: Sample Doctor, MD  
 Doctor's Data, Inc.  
 3755 Illinois Ave.  
 St. Charles, IL 60174 U.S.A.

## Amino Acids; Urine

ESSENTIAL / CONDITIONALLY INDISPENSABLE AMINO ACIDS							
	RESULT μmol/g creatinine	REFERENCE INTERVAL	PERCENTILE				
			2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>	97.5 <sup>th</sup>
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				
			2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>	97.5 <sup>th</sup>
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:	Collection Period: <b>Random</b>	Methodology: <b>LC MS/MS</b>
Date Received:	Volume:	<b>NH<sub>4</sub>, Urea, Creatinine by Automated Chem Analyzer</b>
Date Reported:		



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GASTROINTESTINAL MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μmol/g creatinine	INTERVAL	2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>	97.5 <sup>th</sup>
Ammonia (NH <sub>4</sub> )	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					
			68 <sup>th</sup>		95 <sup>th</sup>		
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	REFERENCE	PERCENTILE				
	μmol/g creatinine	INTERVAL	2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>	97.5 <sup>th</sup>
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					
			68 <sup>th</sup>		95 <sup>th</sup>		
Methionine Sulfoxide	1.6	< 10					

B6, B12, & FOLATE DEPENDANT MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μmol/g creatinine	INTERVAL	2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>	97.5 <sup>th</sup>
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					
			68 <sup>th</sup>		95 <sup>th</sup>		
Beta-aminoisobutyrate	47	< 380					
Beta-alanine	37	< 20					
Homocystine	0.22	< 1					
Sarcosine	3.1	< 10					



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DETOXIFICATION MARKERS						
	RESULT μmol/g creatinine	REFERENCE INTERVAL	PERCENTILE			
			2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>
Methionine	0.86	8- 48	[Bar chart showing result at 50th percentile]			
Cysteine	18	25- 73	[Bar chart showing result at 50th percentile]			
Taurine	1780	220- 1300	[Bar chart showing result at 50th percentile]			
Glutamine	200	155- 650	[Bar chart showing result at 50th percentile]			
Glycine	1340	350- 3500	[Bar chart showing result at 50th percentile]			
Aspartate	6.6	6- 33	[Bar chart showing result at 50th percentile]			

NEUROLOGICAL MARKERS						
	RESULT μmol/g creatinine	REFERENCE INTERVAL	PERCENTILE			
			2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>
Ammonia (NH <sub>4</sub> )	17800	12000- 49000	[Bar chart showing result at 50th percentile]			
Glutamine	200	155- 650	[Bar chart showing result at 50th percentile]			
Phenylalanine	30	25- 100	[Bar chart showing result at 50th percentile]			
Tyrosine	63	28- 120	[Bar chart showing result at 50th percentile]			
Tryptophan	39	20- 100	[Bar chart showing result at 50th percentile]			
Taurine	1780	220- 1300	[Bar chart showing result at 50th percentile]			
Cystathionine	31	8- 50	[Bar chart showing result at 50th percentile]			
Beta-alanine	37	< 20	[Bar chart showing result at 68th percentile]			95 <sup>th</sup>

UREA CYCLE METABOLITES						
	RESULT per creatinine	REFERENCE INTERVAL	PERCENTILE			
			2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>
Arginine	17 μmol/g	8- 55	[Bar chart showing result at 50th percentile]			
Aspartate	6.6 μmol/g	6- 33	[Bar chart showing result at 50th percentile]			
Citrulline	1.4 μmol/g	1- 30	[Bar chart showing result at 50th percentile]			
Ornithine	18 μmol/g	3- 45	[Bar chart showing result at 50th percentile]			
Urea	560 mmol/g	150- 590	[Bar chart showing result at 50th percentile]			
Ammonia (NH <sub>4</sub> )	17800 μmol/g	12000- 49000	[Bar chart showing result at 50th percentile]			
Glutamine	200 μmol/g	155- 650	[Bar chart showing result at 50th percentile]			
Asparagine	32 μmol/g	35- 200	[Bar chart showing result at 50th percentile]			

OTHER						
	RESULT	REFERENCE INTERVAL	PERCENTILE			
			2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>
Creatinine	57 mg/dL	30- 225	[Bar chart showing result at 50th percentile]			



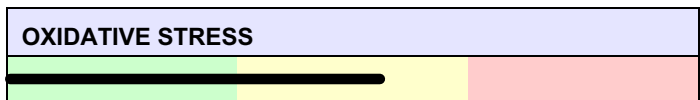
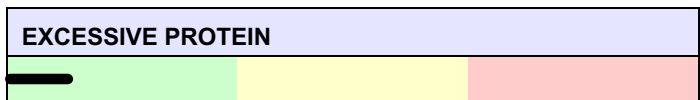
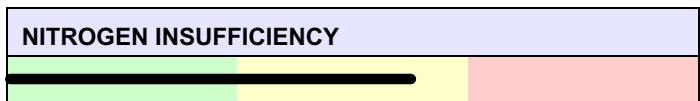
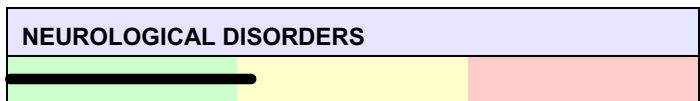
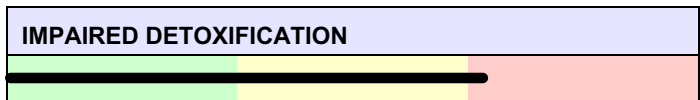
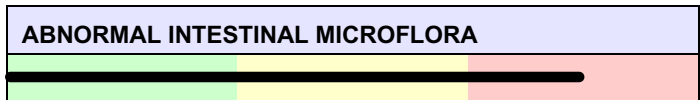
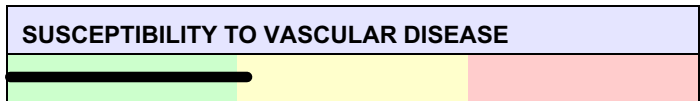
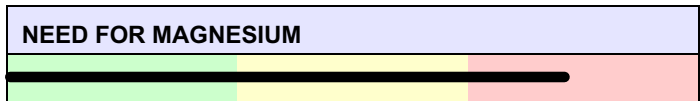
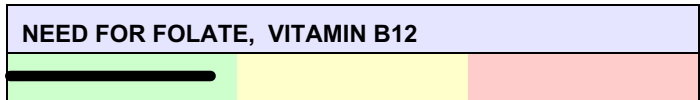
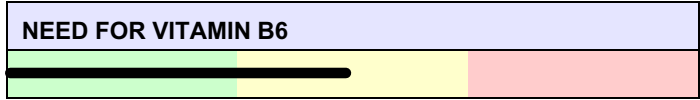
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**SUPPLEMENTATION SCHEDULE**

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**



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

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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 dysbiosis (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) cystinuria or hypertauroinuria. Supplementation with N-acetyl cysteine may be beneficial except in cystinuria, 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.

**Asparagine (low)**

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