



LAB #: U000000-0000-0  
 PATIENT: Sample Patient  
 ID: PATIENT-S-0000  
 SEX: Female  
 DOB: 01/01/1977

CLIENT #: 12345  
 DOCTOR:  
 Doctor's Data, Inc.  
 3755 Illinois Ave.  
 St. Charles, IL 60174 USA

## Amino Acids; Urine

SPECIMEN VALIDITY								
	RESULT per 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>	
Creatinine	130 mg/dL	35- 225			●			
Glutamine/Glutamate	5.9	5- 160	████████████████████					
Ammonia Level (NH <sub>4</sub> )	28500 μM/g	12000- 49000	████████████████████					

Specimen Validity Index	████████████████████
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ESSENTIAL / CONDITIONALLY INDISPENSABLE AMINO ACIDS							
	RESULT μM/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	7.6	8- 48	████████████████████				
Lysine	160	40- 530	████████████████████				
Threonine	77	75- 330	████████████████████				
Leucine	16	22- 100	████████████████████				
Isoleucine	5.5	9- 50	████████████████████				
Valine	21	15- 70	████████████████████				
Phenylalanine	39	25- 100	████████████████████				
Tryptophan	31	20- 100	████████████████████				
Taurine	4870	220- 1300	████████████████████				
Cysteine	21	25- 73	████████████████████				
Arginine	23	8- 55	████████████████████				
Histidine	420	350- 1700	████████████████████				

NONESENTIAL AMINO ACIDS							
	RESULT μM/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	200	130- 600	████████████████████				
Aspartate	11	8- 30	████████████████████				
Asparagine	73	35- 200	████████████████████				
Glutamine	230	200- 740	████████████████████				
Glutamate	39	6- 52	████████████████████				
Cystine	75	30- 105	████████████████████				
Glycine	2310	500- 4100	████████████████████				
Tyrosine	51	28- 120	████████████████████				
Serine	240	180- 600	████████████████████				
Proline	5.6	1- 55	████████████████████				



GASTROINTESTINAL MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μM/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> )	28500	12000- 49000					
Ethanolamine	63	120- 440					
Alpha-Aminoadipitate	30	6- 72					
Threonine	77	75- 330					
Tryptophan	31	20- 100					
Taurine	4870	220- 1300					
				68 <sup>th</sup>	95 <sup>th</sup>		
Beta-alanine	20	< 20					
Beta-aminoisobutyrate	57	< 380					
Anserine	15	< 95					
Carnosine	12	< 50					
Gamma-aminobutyrate	2.3	< 15					
Hydroxyproline	1.4	< 45					

MAGNESIUM DEPENDANT MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μM/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	4.2	1- 30					
Ethanolamine	63	120- 440					
Phosphoethanolamine	32	20- 75					
Phosphoserine	0.16	0.05- 0.8					
Serine	240	180- 600					
Taurine	4870	220- 1300					
				68 <sup>th</sup>	95 <sup>th</sup>		
Methionine Sulfoxide	10	< 10					

B6, B12, & FOLATE DEPENDANT MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μM/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	240	180- 600					
Alpha-aminoadipate	30	6- 72					
Cysteine	21	25- 73					
Cystathionine	12	8- 50					
1-Methylhistidine	190	70- 280					
3-Methylhistidine	420	55- 1100					
Alpha-amino-N-butyrate	12	5- 72					
				68 <sup>th</sup>	95 <sup>th</sup>		
Beta-aminoisobutyrate	57	< 380					
Beta-alanine	20	< 20					
Homocystine	0.14	< 5					
Sarcosine	3.3	< 50					



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DETOXIFICATION MARKERS								
	RESULT μM/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	7.6	8- 48						
Cysteine	21	25- 73						
Taurine	4870	220- 1300						
Glutamine	230	200- 740						
Glycine	2310	500- 4100						
Aspartate	11	8- 30						

NEUROLOGICAL MARKERS								
	RESULT μM/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>	
Ammonia (NH <sub>4</sub> )	28500	12000- 49000						
Glutamine	230	200- 740						
Phenylalanine	39	25- 100						
Tyrosine	51	28- 120						
Tryptophan	31	20- 100						
Taurine	4870	220- 1300						
Cystathionine	12	8- 50						
					68 <sup>th</sup>		95 <sup>th</sup>	
Beta-alanine	20	< 20						

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>	97.5 <sup>th</sup>	
Arginine	23 μM/g	8- 55						
Aspartate	11 μM/g	8- 30						
Citrulline	4.2 μM/g	1- 30						
Ornithine	12 μM/g	3- 45						
Urea	230 mM/g	150- 590						
Ammonia (NH <sub>4</sub> )	28500 μM/g	12000- 49000						
Glutamine	230 μM/g	200- 740						
Asparagine	73 μM/g	35- 200						

SPECIMEN DATA		
Comments:		
Date Collected: 07/31/2013	Collection Period: Random	Methodology: LC MS/MS
Date Received: 08/02/2013	Volume:	NH <sub>4</sub> , Urea, Creatinine by Automated Chem Analyzer
Date Completed: 08/07/2013		

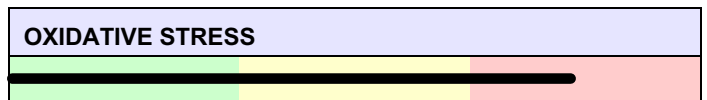
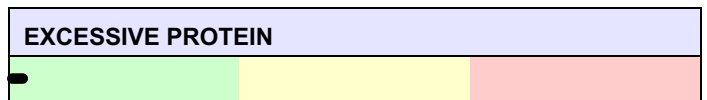
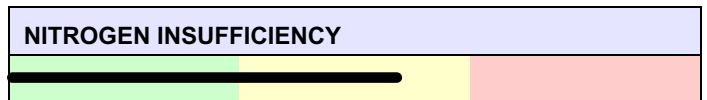
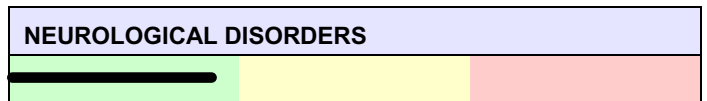
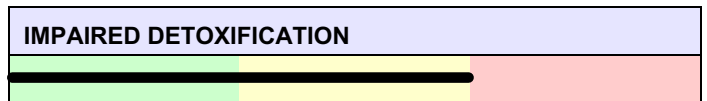
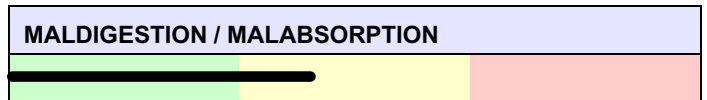
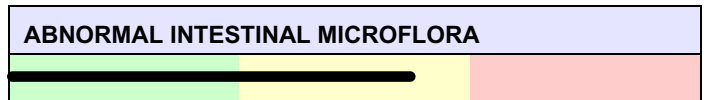
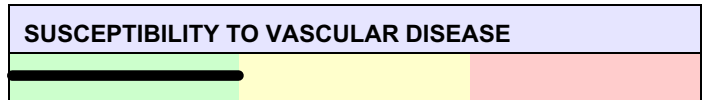
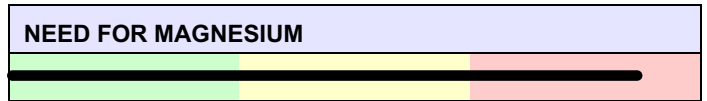
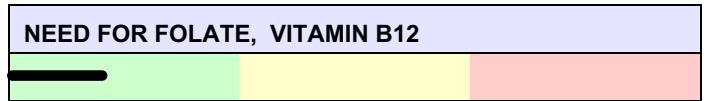
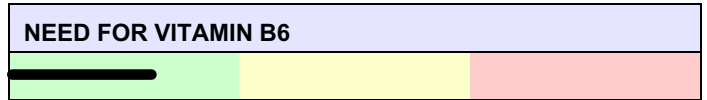


**SUPPLEMENTATION SCHEDULE**

L-configured Amino Acids	Total Daily Oral Dose
Tryptophan	240 mg
Arginine	745 mg
Histidine	750 mg
Isoleucine	1255 mg
Leucine	1630 mg
Lysine	745 mg
Methionine	900 mg
Phenylalanine	1025 mg
Threonine	785 mg
Valine	1250 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.

For a given age and gender, intra-individual variability in daily creatinine excretion can vary by as much as two-fold. Therefore, to more accurately assess amino acid status using a random collection, the reported values for each analyte are expressed per gram "normalized" creatinine. Creatinine values are adjusted to account for body surface

area (BSA) using the formula:

CreatinineN (Normalized) = creatinine concentration x (1.73/BSA).

**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.

**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.

**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,

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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.

#### Ethanolamine (low)

Ethanolamine, a metabolite of the nonessential amino acid serine, is low in this urine specimen. In the presence of adequate levels of functional B-6 (P-5-P) serine is enzymatically converted to ethanolamine; therefore, ethanolamine could be low as a consequence of P-5-P insufficiency. Alternatively, since serine is derived directly from dietary protein and, endogenously from phosphoserine, glycine and threonine, deficiencies of these precursor metabolites could also result in low levels of ethanolamine. Ethanolamine is important in the body as a precursor of phosphoethanolamine, phosphotidylcholine, choline and the neurotransmitter acetylcholine. Therefore, a deficiency of ethanolamine can be responsible for suppressed activity of the parasympathetic nervous system (eg. GI motility) and poor memory and cognitive function. Symptoms can vary as a function of dietary intake of phosphotidylcholine (lecithin) as a source of choline. Low ethanolamine is usually associated with insufficient protein intake.

#### 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.

#### Methionine sulfoxide (High)

Methionine sulfoxide, an abnormal toxic metabolite, is high in this urine specimen. Usually this is indicative of magnesium deficiency since the first enzymatic step in methionine metabolism (formation of s-adenosylmethionine) requires magnesium. However, this is not certain and other steps in methionine metabolism may be impaired. Check serine, intracellular magnesium (Red Blood Cell Elements) and B-6 status.