



LAB #: B\$\$\$\$\$!\$\$\$\$\$  
 PATIENT: Glu d`YDUjYbh  
 ID: D5 H9 BHIG-00077  
 SEX: Male  
 AGE: 25

CLIENT #: %& ( )  
 DOCTOR:  
 8 cWc ffg' 8 ULz-bW  
 ' +) ) '=]bc]g' 5 j Y"  
 Gh"7 \ Uf`Ygz=@\* \$%+(

## Amino Acids; Plasma

SPECIMEN VALIDITY			
	RESULT	REFERENCE INTERVAL	PERCENTILE
			5th 32 <sup>nd</sup>
Glutamine/Glutamate	6.5	> 8.5	
Asparagine/Aspartate	7.2	> 7.5	
			68 <sup>th</sup> 95 <sup>th</sup>
Ammonia	39 $\mu\text{M/dL}$	< 30	
Specimen Validity Index			

ESSENTIAL / CONDITIONALLY INDISPENSABLE AMINO ACIDS					
	RESULT $\mu\text{M/dL}$	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	2.8	1.6- 3.6			
Taurine	5.4	4.5- 16			
Lysine	21	15- 26			
Threonine	15	9- 20			
Tryptophan	5.5	3- 7			
Phenylalanine	6.2	4- 9			
Leucine	18	7.5- 18			
Isoleucine	7.8	4- 10			
Valine	29	13- 31			
Arginine	7.8	4.5- 13			
Histidine	9.3	5- 10			

NONESSENTIAL AMINO ACIDS					
	RESULT $\mu\text{M/dL}$	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	32	23- 64			
Aspartate	0.43	0.15- 1.6			
Asparagine	3.1	3.5- 7.5			
Glutamine	32	36- 63			
Glutamate	4.9	2- 15			
Cystine	5.9	2- 6.5			
Glycine	26	15- 50			
Tyrosine	8.5	4- 10			
Serine	9.5	6- 16			
Proline	28	10- 31			



GASTROINTESTINAL MARKERS								
	RESULT μM/dL	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>	
Ethanolamine	1.3	0.2- 1.3						
Threonine	15	9- 20						
Tryptophan	5.5	3- 7						

						68 <sup>th</sup>	95 <sup>th</sup>
Alpha-Aminoadipate	0.18	< 0.3					
Beta-alanine	0.4	< 1					
Beta-aminoisobutyrate	0.11	< 0.5					
Anserine	< dl	< 0.1					
Carnosine	< dl	< 0.1					
Gamma-aminobutyrate	< dl	< 0.1					
Hydroxyproline	1.3	< 3					

MAGNESIUM DEPENDANT MARKERS							
	RESULT μM/dL	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>
Citrulline	3.8	1.9- 6.4					
Ethanolamine	1.3	0.2- 1.3					
Phosphoethanolamine	0.13	0.08- 1					
Phosphoserine	0.007	0.013- 0.025					
Serine	9.5	6- 16					
Taurine	5.4	4.5- 16					

						68 <sup>th</sup>	95 <sup>th</sup>
Methionine Sulfoxide	0.61	< 1					

B6, B12, & FOLATE DEPENDANT MARKERS							
	RESULT μM/dL	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>
Cystine	5.9	2- 6.5					
Alpha-amino-N-butyrate	3.3	1- 3.5					
Histidine	9.3	5- 10					
Serine	9.5	6- 16					

						68 <sup>th</sup>	95 <sup>th</sup>
Cystathionine	< dl	< 0.05					
Alpha-aminoadipate	0.18	< 0.3					
Beta-aminoisobutyrate	0.11	< 0.5					
Beta-alanine	0.4	< 1					
Homocystine	< dl	< 0.05					
Sarcosine	1.3	< 0.8					
1-Methylhistidine	0.53	< 1.5					
3-Methylhistidine	1.8	< 4.5					



PATIENT: GUa d`YDUHjYbh  
 DOCTOR: 8 cWrcffj'8 UHŁ-bW  
 LAB#: B\$\$\$\$\$!\$\$\$\$!  
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DETOXIFICATION MARKERS								
	RESULT μM/dL	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	2.8	1.6- 3.6						
Cystine	5.9	2- 6.5						
Taurine	5.4	4.5- 16						
Glutamine	32	36- 63						
Glycine	26	15- 50						
Aspartate	0.43	0.15- 1.6						

NEUROLOGICAL MARKERS								
	RESULT μM/dL	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>	
Glutamine	32	36- 63						
Phenylalanine	6.2	4- 9						
Tyrosine	8.5	4- 10						
Tryptophan	5.5	3- 7						
Taurine	5.4	4.5- 16						
Cystine	5.9	2- 6.5						
				68 <sup>th</sup>		95 <sup>th</sup>		
Beta-alanine	0.4	< 1						
Cystathionine	< dl	< 0.05						

UREA CYCLE METABOLITES								
	RESULT μM/dL	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	7.8	4.5- 13						
Aspartate	0.43	0.15- 1.6						
Citrulline	3.8	1.9- 6.4						
Ornithine	11	4- 16						
Urea	290	230- 880						
Glutamine	32	36- 63						
Asparagine	3.1	3.5- 7.5						

SPECIMEN DATA	
Comments:	
Date Collected: 12/1/2011	Methodology: LC MS/MS
Date Received: 12/6/2011	NH <sub>4</sub> by Automated Chem Analyzer
Date Completed: 12/7/2011	Reference ranges are representative of a healthy population under fasting (6-8 hours) conditions. v3



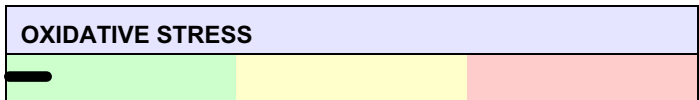
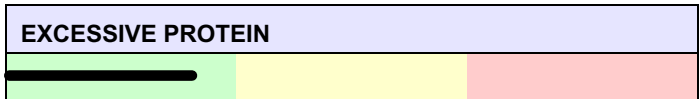
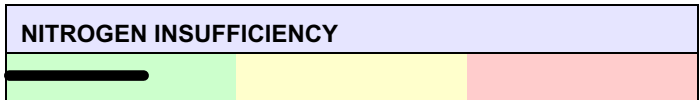
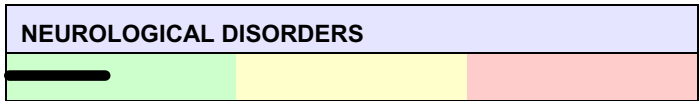
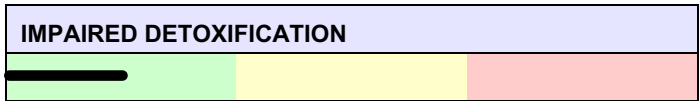
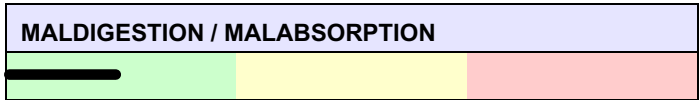
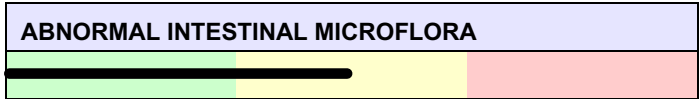
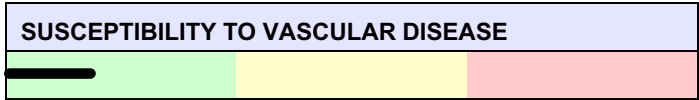
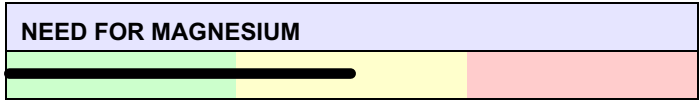
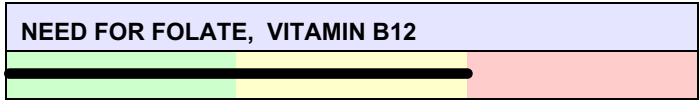
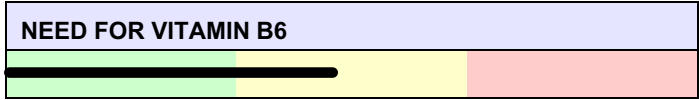
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 DOCTOR: 8 cWrcffj'8 UHŁ-bW  
 LAB#: B\$\$\$\$\$!\$\$\$\$!  
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**SUPPLEMENTATION SCHEDULE**

**PRESUMPTIVE NEEDS / IMPLIED CONDITIONS**

L-configured Amino Acids	Total Daily Oral Dose
Tryptophan	295 mg
Arginine	930 mg
Histidine	735 mg
Isoleucine	930 mg
Leucine	1280 mg
Lysine	930 mg
Methionine	765 mg
Phenylalanine	1280 mg
Threonine	805 mg
Valine	1290 mg
Pyridoxal-5-phosphate	30 mg
Alpha-ketoglutarate	650 mg
Taurine	85 mg

Directions: Amino acids are best taken between meals unless instructed differently by your physician. Twice daily, dissolve one and ½ teaspoons (5grams) into a small amount of warm water, add water or juice, stir and drink immediately. For children under 12 years of age, consume one teaspoon 1-2 times per day; the amino acid formula can be added to applesauce but should not be mixed with other beverages or foods that contain protein (e.g. milk, yogurt). If you experience heightened energy that interferes with sleep, take the second daily dose earlier in the day. Patients typically take the amino acid supplement daily for up to 3 months before repeating the Plasma Amino Acid Test to re-evaluate the need for supplementation.



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This recommended Amino Acid Supplement Schedule was calculated based upon the difference between the test results for this specific patient and optimal plasma 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. 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.

#### PAA INTRODUCTION

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. The "Presumptive Needs/Implied Conditions" are considered to be possible or probable rather than definite for the individual. 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. Reference ranges are representative of a healthy population under fasting (6-8 hours) conditions.

"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).

#### Ammonia (high)

The level of ammonia in this specimen is abnormally high, which is often indicative of post-collection, generalized decay of amino acids as a result of improper preservation or specimen handling. Other possible reasons for a high level of ammonia include hyperammonemia of metabolic origin, or bacterial infection of the gastrointestinal or urinary tracts. Check for other markers of dysbiosis ( see GI markers section), or urinary tract infection (elevated B-aminoisobutyrate, hydroxyproline, ethanolamine, phosphoethanolamine). Ammonia that is generated in the normal metabolism of amino acids is transported to the liver for detoxification via the urea cycle. To assess the potential for impaired urea cycle function, check for elevated levels of ornithine, glutamine and asparagine and, low levels of arginine and/or citrulline. Elevated systemic levels of ammonia are toxic and possible symptoms include: protein

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intolerance, headaches (migraine), fatigue, irritability, diarrhea, and nausea. These may be episodic symptoms associated with high protein meals. Chronically elevated ammonia in the CNS can result in decreased cognitive function, confusion, slurred speech and blurred vision.

#### Leucine (high)

Leucine, an essential amino acid, is abnormally high in this plasma specimen. Leucine, isoleucine and valine are branched-chain structural amino acids whose catabolism requires multiple nutrient co-factors including P-5-P, thiamin, riboflavin, lipoic acid, Coenzyme-A, biotin and magnesium. Branched chain amino acids are often elevated as a result of deficiency of B-6 and/or thiamin, or excessive supplementation with protein (eg. whey protein) or the specific amino acids for body building/exercise recovery purposes. A more serious, but rare cause of branched-chain hyperaminoaciduria is known as Maple Syrup Urine Disease (MSUD) that results from an inherited enzymatic defect. Symptoms of MSUD may be episodic with protein intake. In infants and children MSUD symptoms include vomiting, irritability, lethargy, food refusal, muscle hypertonicity and respiratory difficulties. Convulsions and seizures may occur in acute cases. Individuals presenting with moderate branched-chain hyperaminoacidemia should be retested after reduction in protein intake and supplementation with B-6 and thiamin. Those with MSUD should pursue professional advice regarding the avoidance of foods that are high in branched-chain amino acids.

#### Asparagine (low)

Asparagine, a nonessential amino acid, is low in this plasma specimen. Asparagine is derived from dietary protein; soy protein, beans, nuts and seeds are relatively high in asparagine. Asparagine is biosynthesized from aspartate and glutamine by a magnesium-dependant enzymatic process that helps minimize the 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, urea and ammonia.

#### Glutamine (low)

Glutamine, a nonessential amino acid, is low in this plasma specimen. Glutamine is derived directly from dietary protein, and also formed endogenously by addition of ammonia to glutamate. In the CNS the formation of glutamine from glutamate provides a disposal mechanism that protects against excess accumulation of cytotoxic ammonia. Low glutamine can be a result of protein malnutrition or negative nitrogen balance, incomplete digestive proteolysis or other malabsorption syndromes, or chronic alcoholism. Glutamine can also be artifactually low as a result of sample decay in which glutamine is broken down to glutamate and ammonia due to improper, post-collection preservation and handling of the blood specimen.

#### Ethanolamine (high)

Ethanolamine, a metabolite of serine metabolism, is high in this plasma specimen. Ethanolamine and phosphoethanolamine are precursors of the neurotransmitter acetylcholine. The conversion of ethanolamine to phosphoethanolamine involves a magnesium dependent kinase. When ethanolamine is high or normal and phosphoethanolamine is low, there is a presumptive need for

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magnesium. Ethanolamine can also be a product of bacterial infection in the urinary tract or the intestine (dysbiosis).

Phosphoserine (low)

The nonessential amino acid phosphoserine is low in this plasma specimen. Phosphoserine is derived directly from dietary sources and, metabolically as an intermediary metabolite from glycolysis and gluconeogenesis. Phosphoserine may be low in association with a very poor diet that is extremely low in protein, calories, B-6 and/ or magnesium. Hormonal dysfunctions, vitamin D deficiency, and calcium deficit are other possible reasons for low phosphoserine.

Sarcosine (high)

Sarcosine, an intermediary metabolite in the conversion of choline or betaine to glycine, is high in this plasma specimen. Sarcosine is not normally detected in urine or blood. However, mild elevations are occasionally found in individuals who take supplemental betaine, choline (lecithin), or dimethylglycine that may cause increased needs for folic acid, B-12 and riboflavin. Mild hyper-sarcosinemia is not typically associated with clinical symptoms but, formaldehyde tolerance may be limited and exposure to toxic chemicals may in fact have caused the aberration in amino acid metabolism. The Hepatic Detoxification Profile (D-glucaric and mercaptuic acids) can be utilized to assess exposure to toxic chemicals and the status of phase II detoxification.