Amino Acids; Urine

ESSENTIAL / CONDITIONALLY INDISPENSABLE AMINO ACIDS	RESULT µM/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Methionine	**14**	12 - 46	
Lysine	**1940**	55 - 550	
Threonine	**180**	80 - 400	
Leucine	**52**	17 - 95	
Isoleucine	**9.7**	7 - 35	
Valine	**37**	20 - 94	
Phenylalanine	**85**	40 - 180	
Tryptophan	**83**	35 - 145	
Taurine	**490**	200 - 1600	
Cysteine	**52**	35 - 93	
Arginine	**100**	12 - 70	
Histidine	**1880**	520 - 2100	

NONESSENTIAL AMINO ACIDS	RESULT µM/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Alanine	**400**	170 - 800	
Aspartate	**12**	7 - 30	
Asparagine	**240**	60 - 360	
Glutamine	**810**	155 - 900	
Glutamate	**28**	10 - 80	
Cystine	**210**	28 - 91	
Glycine	**1720**	560 - 3800	
Tyrosine	**130**	60 - 225	
Serine	**440**	170 - 760	
Proline	**13**	2 - 90	

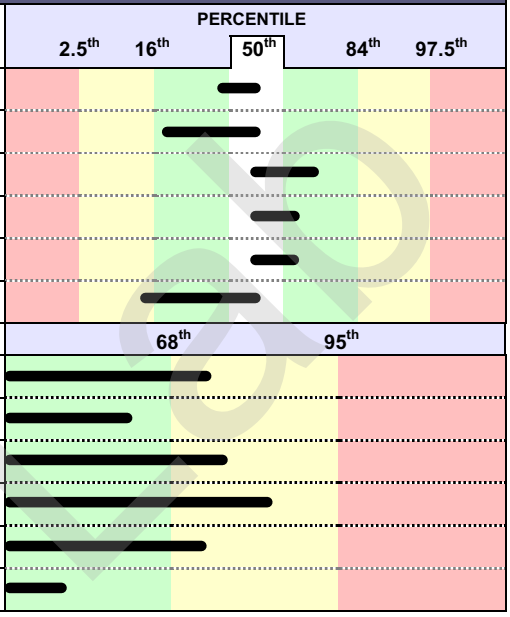
SPECIMEN DATA

v3

DOCTOR'S DATA INC

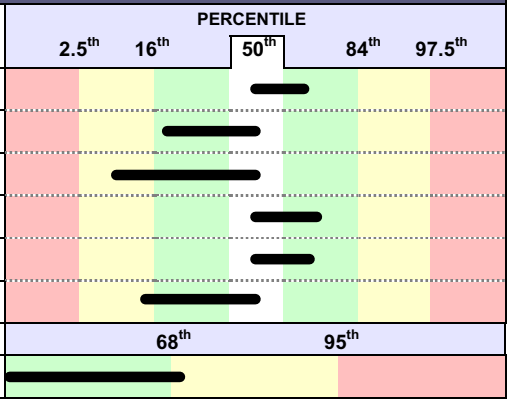
GASTROINTESTINAL MARKERS

	RESULT µM/g creatinine	REFERENCE INTERVAL
Ammonia (NH_4)	**31900**	16000 - 75000
Ethanolamine	**300**	150 - 580
Alpha-Aminoadipitate	**53**	8 - 100
Threonine	**180**	80 - 400
Tryptophan	**83**	35 - 145
Taurine	**490**	200 - 1600
Beta-alanine	**7.5**	< 22
Beta-aminoisobutyrate	**120**	< 470
Anserine	**110**	< 200
Carnosine	**150**	< 200
Gamma-aminobutyrate	**4.2**	< 8
Hydroxyproline	**8.3**	< 60



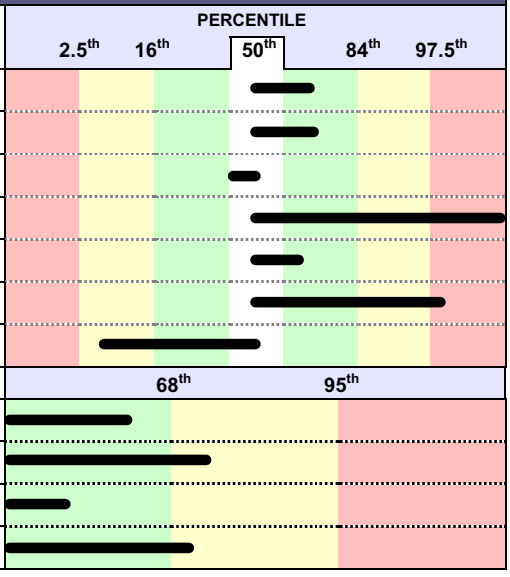
MAGNESIUM DEPENDANT MARKERS

	RESULT µM/g creatinine	REFERENCE INTERVAL
Citrulline	**21**	1 - 47
Ethanolamine	**300**	150 - 580
Phosphoethanolamine	**50**	46 - 140
Phosphoserine	**0.76**	0.07 - 1.2
Serine	**440**	170 - 760
Taurine	**490**	200 - 1600
Methionine Sulfoxide	**5.8**	< 15



B6, B12, & FOLATE DEPENDANT MARKERS

	RESULT µM/g creatinine	REFERENCE INTERVAL
Serine	**440**	170 - 760
Alpha-aminoadipate	**53**	8 - 100
Cysteine	**52**	35 - 93
Cystathionine	**52**	10 - 43
1-Methylhistidine	**240**	130 - 430
3-Methylhistidine	**930**	55 - 900
Alpha-amino-N-butyrate	**10**	8 - 65
Beta-aminoisobutyrate	**120**	< 470
Beta-alanine	**7.5**	< 22
Homocystine	**0.19**	< 1
Sarcosine	**2.2**	< 10



DOCTOR'S DATA INC

DETOXIFICATION MARKERS

	RESULT µM/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Methionine	**13**	12 - 46	
Cysteine	**52**	35 - 93	
Taurine	**491**	200 - 1600	
Glutamine	**810**	155 - 900	
Glycine	**1720**	560 - 3800	
Aspartate	**12**	7 - 30	

NEUROLOGICAL MARKERS

	RESULT µM/g creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Ammonia (NH_4)	**31900**	16000 - 75000	
Glutamine	**810**	155 - 900	
Phenylalanine	**85**	40 - 180	
Tyrosine	**130**	60 - 225	
Tryptophan	**83**	35 - 145	
Taurine	**490**	200 - 1600	
Cystathionine	**52**	10 - 43	
			68th 95th
Beta-alanine	**7.5**	< 22	

UREA CYCLE METABOLITES

	RESULT per creatinine	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Arginine	**100 µM/g**	12 - 70	
Aspartate	**12 µM/g**	7 - 30	
Citrulline	**21 µM/g**	1 - 47	
Ornithine	**60 µM/g**	5 - 55	
Urea	**340 mM/g**	210 - 750	
Ammonia (NH_4)	**31900 µM/g**	16000 - 75000	
Glutamine	**810 µM/g**	155 - 900	
Asparagine	**240 µM/g**	60 - 360	

OTHER

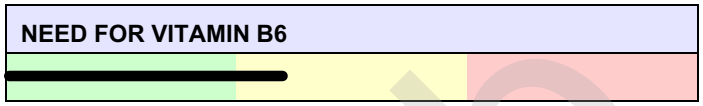
	RESULT	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Creatinine	**110 mg/dL**	25 - 180	

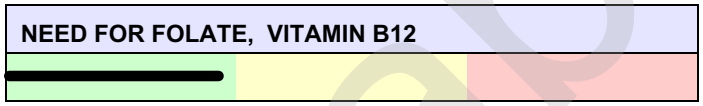
SUPPLEMENTATION SCHEDULE

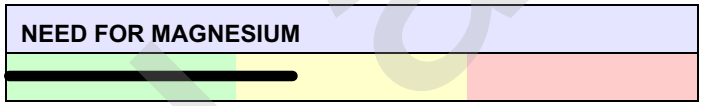
L-configured Amino Acids	Total Daily Oral Dose
Tryptophan	**290 mg**
Arginine	**910 mg**
Histidine	**715 mg**
Isoleucine	**910 mg**
Leucine	**1245 mg**
Lysine	**910 mg**
Methionine	**960 mg**
Phenylalanine	**1245 mg**
Threonine	**785 mg**
Valine	**1255 mg**
Pyridoxal-5-phosphate	**30 mg**
Alpha-ketoglutarate	**650 mg**
Taurine	**95 mg**

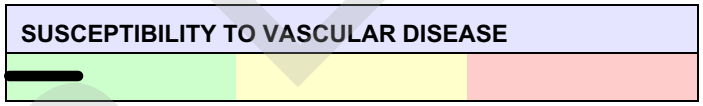
The supplement schedule is not intended for use by pregnant females and is strictly contraindicated for individuals with suspected or known renal insufficiency or renal failure.

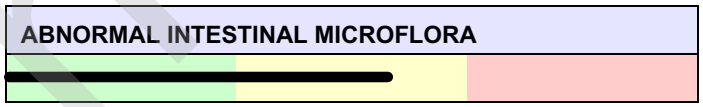
PRESUMPTIVE NEEDS / IMPLIED CONDITIONS

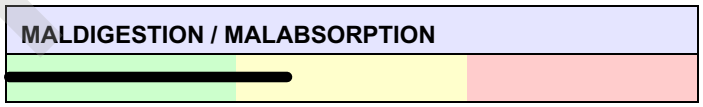


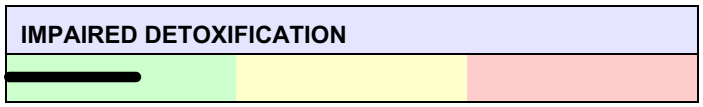


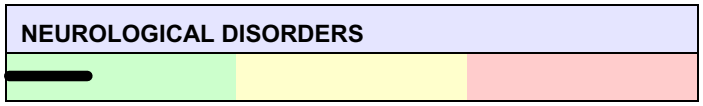


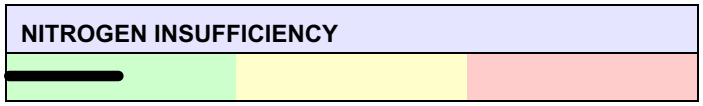


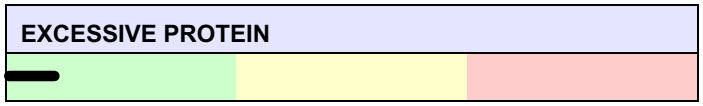


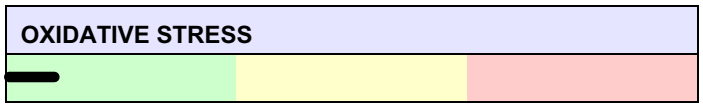












This recommended Amino Acid Supplement Schedule was calculated based upon the difference between the test results for this specific patient and optimal urine levels, and guidelines for human amino acid requirements as provided by the Food and Nutrition Board of the NRC. The schedule has been provided 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).

Lysine (high)

Lysine, an essential amino acid, is abnormally elevated in this urine specimen. Nutritional or therapeutic supplementation of lysine (herpes virus) should be ruled out as an inconsequential cause of elevated urinary lysine. A second causal factor for hyperlysinurea is known as lysinic protein intolerance (LPI). LPI entails decreased intestinal absorption and increased renal excretion of lysine. LPI is an inherited disorder that can be associated with an aversion to protein, diarrhea, vomiting and seizures in infancy. Later in life LPI can be associated with protein intolerances (GI distress), muscle weakness, mental retardation, short stature and possibly occular dysfunction with lens opacity. Blood urea nitrogen may be low, serum ferritin and thyroxine may be elevated, and tissue iron levels are often low. Instead of a transport disorder, there may be deficiencies in specific cofactors that disrupt lysine metabolism. These include P-5-P, alpha-ketoglutarate, and/or niacin. Treatment for metabolic hyperlysinurea depends on blood levels and should include ensuring the adequacy of the mentioned cofactors. Food intolerances should be identified and the diet modified accordingly. Carnitine supplementation may improve growth by sparing lysine and enhancing fatty acid oxidation.

Arginine (high)

The semiessential amino acid arginine is elevated in this urine specimen. Rule out oral supplementation (anabolic aid) as a trivial cause. Also check for lysine supplementation (treatment of herpes virus) because lysine is a competitive inhibitor of the enzyme arginase. Physiologically, in the urea cycle arginine is the precursor of urea and ornithine. Check for low levels of those metabolites. Arginase activity requires manganese; a mineral analysis for manganese may be warranted. Since arginine stimulates the pancreatic release of insulin, elevated arginine may invoke hyperinsulinemia and hypoglycemia. Urinary arginine may also be elevated along with lysine and ornithine in hyperdibasic aminoacidurea as a result of subnormal renal conservation of these amino acids.

Cystine (high)

Cystine, the oxidized dimmer form of cysteine, is high in this urine specimen. Cystine is derived from dietary protein and, formed endogenously from two cysteines. Cystinurea is an inheritable disorder of amino acid transport affecting the epithelial cells of the renal tubules and the GI tract. The defect occurs in the shared dibasic-cystine transport protein. Potential clinical consequences are cystine urorolithiosis (crystalline cystine in the kidneys), urinary tract infections, hypertension and possibly renal failure. Many cases of cystinurea are sub acute (heterozygous), and urine cystine levels are elevated but do not reach the solubility limit for cystine and crystals are not formed. Even in such cases there may be increased allergic sensitivities and inflammatory responses and, limited tolerance to xenobiotics due to limited or subnormal levels of glutathione. Patients exhibiting hypercystinurea should limit intake of foods and nutritional supplements that are relatively

high in cysteine/cystine/methionine (eg. cheeses, whey protein, fish, poultry, beef and eggs, N-AC, GSH), consume plenty of good water (about 40 ml/kg/day), maintain urine pH near 7.0 (citrates) and, avoid exposure to xenobiotics and allergenic substances. Dithiol chelators, such as DMSA, that are excreted bound to kidney-derived cysteine can be helpful when crystallization is a problem.

Cystathionine (high)

Cystathionine is abnormally elevated in this urine specimen. Cystathionine is an intermediary metabolite that is formed in the sequential enzymatic conversion of methionine (essential amino acid) to cysteine. Mildly elevated cystathionine can be an acquired nutritional condition that is readily corrected with adequate B-6/P-5-P supplementation. It can also be an inherited (heterozygous, slight) condition that can be resolved or markedly improved with supplementation of B-6/P-5-P and limitation of foods that are high in methionine. Rarely (4 out of 10,000), a more severe, homozygous cystathioninurea occurs that features cytathionine levels in excess of 500 micrograms/24 hr. Many individuals with this later condition appear to be normal and asymptomatic. However, if the decreased conversion of cystathionine to cysteine is accompanied by insufficient dietary cysteine, there could also be a cysteine deficiency that could be associated with subnormal intracellular glutathione and decreased antioxidant and detoxification (chemical and heavy metal) capacity, and increased inflammatory response.

3-Methylhistidine (high)

3-methylhistidine is high in this urine specimen. 3-methylhistidine is derived primarily from skeletal muscle, and to a lesser extent from skin. Elevated 3-methylhistidine may be indicative of an abnormal rate of catabolism of muscle protein in the body or an abnormal rate of turnover of muscle tissue. This may be a degenerative condition, or simply the result of very strenuous, prolonged exercise/athletic training. 3-methylhistidine may also be higher than normal if the diet or assimilation of folic acid and B-12 are insufficient.

Ornithine (high)

Ornithine, an intermediary metabolite in the urea cycle, is high in this urine specimen. If glutamine and/or asparginine are also high, this condition may be indicative of limited capacity for ammonia detoxification and a low protein diet may be required to provide relief. Ornithine can also accumulate if B-6 is deficient. Limited ammonia detoxification can result in toxic accumulation of ammonia in tissues and be associated with severe headaches, fatigue, irritability, protein intolerance and decreased mental functioning. Moderate to severe cystinurea is also associated with urinary wasting of ornithine.