



Amino Acids; Urine

ESSENTIAL / CONDITIONALLY INDISPENSABLE AMINO ACIDS							
	RESULT μmol/g creatinine	REFERENCE INTERVAL	PERCENTILE				
			2.5 th	16 th	50 th	84 th	97.5 th
Methionine	5.5	8 - 48					
Lysine	50	40 - 530					
Threonine	73	56 - 320					
Leucine	27	8 - 80					
Isoleucine	13	5 - 30					
Valine	40	15 - 70					
Phenylalanine	21	25 - 100					
Tryptophan	16	20 - 100					
Taurine	6890	220 - 1300					
Cysteine	55	25 - 73					
Arginine	26	8 - 55					
Histidine	89	350 - 1700					

NONESSENTIAL AMINO ACIDS							
	RESULT μmol/g creatinine	REFERENCE INTERVAL	PERCENTILE				
			2.5 th	16 th	50 th	84 th	97.5 th
Alanine	98	130 - 600					
Aspartate	6.7	6 - 33					
Asparagine	32	35 - 200					
Glutamine	180	155 - 650					
Glutamate	12	10 - 52					
Cystine	47	30 - 105					
Glycine	980	350 - 3500					
Tyrosine	39	28 - 120					
Serine	260	125 - 560					
Proline	8.8	1 - 55					

SPECIMEN DATA		
Comments:		
Date Collected: 06/05/2024	Collection Period: Random	Methodology: LC MS/MS
Date Received: 06/08/2024	Volume:	NH ₄ , Urea, Creatinine by Automated Chem Analyzer
Date Reported: 06/11/2024		

v3



GASTROINTESTINAL MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μmol/g creatinine	INTERVAL	2.5 th	16 th	50 th	84 th	97.5 th
Ammonia (NH ₄)	25200	12000 - 49000					
Ethanolamine	300	120 - 440					
Alpha-Aminoadipitate	66	6 - 72					
Threonine	73	56 - 320					
Tryptophan	16	20 - 100					
Taurine	6890	220 - 1300					
				68 th		95 th	
Beta-alanine	250	< 20					
Beta-aminoisobutyrate	340	< 380					
Anserine	230	< 95					
Carnosine	21	< 50					
Gamma-aminobutyrate	3.5	< 7					
Hydroxyproline	6.9	< 45					
MAGNESIUM DEPENDANT MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μmol/g creatinine	INTERVAL	2.5 th	16 th	50 th	84 th	97.5 th
Citrulline	3.4	1 - 30					
Ethanolamine	300	120 - 440					
Phosphoethanolamine	17	20 - 75					
Phosphoserine	0.17	0.05 - 0.8					
Serine	260	125 - 560					
Taurine	6890	220 - 1300					
				68 th		95 th	
Methionine Sulfoxide	5.4	< 10					
B6, B12, & FOLATE DEPENDANT MARKERS							
	RESULT	REFERENCE	PERCENTILE				
	μmol/g creatinine	INTERVAL	2.5 th	16 th	50 th	84 th	97.5 th
Serine	260	125 - 560					
Alpha-aminoadipate	66	6 - 72					
Cysteine	55	25 - 73					
Cystathionine	32	8 - 50					
1-Methylhistidine	410	70 - 280					
3-Methylhistidine	2610	55 - 1100					
Alpha-amino-N-butyrate	8.7	5 - 72					
				68 th		95 th	
Beta-aminoisobutyrate	340	< 380					
Beta-alanine	250	< 20					
Homocystine	0.14	< 1					
Sarcosine	9.5	< 10					



DETOXIFICATION MARKERS						
	RESULT μmol/g creatinine	REFERENCE INTERVAL	PERCENTILE			
			2.5 th	16 th	50 th	84 th
Methionine	5.5	8 - 48	[Bar chart showing result at 50th percentile]			
Cysteine	55	25 - 73	[Bar chart showing result at 50th percentile]			
Taurine	6890	220 - 1300	[Bar chart showing result at 50th percentile]			
Glutamine	180	155 - 650	[Bar chart showing result at 50th percentile]			
Glycine	980	350 - 3500	[Bar chart showing result at 50th percentile]			
Aspartate	6.7	6 - 33	[Bar chart showing result at 50th percentile]			

NEUROLOGICAL MARKERS						
	RESULT μmol/g creatinine	REFERENCE INTERVAL	PERCENTILE			
			2.5 th	16 th	50 th	84 th
Ammonia (NH ₄)	25200	12000 - 49000	[Bar chart showing result at 50th percentile]			
Glutamine	180	155 - 650	[Bar chart showing result at 50th percentile]			
Phenylalanine	21	25 - 100	[Bar chart showing result at 50th percentile]			
Tyrosine	39	28 - 120	[Bar chart showing result at 50th percentile]			
Tryptophan	16	20 - 100	[Bar chart showing result at 50th percentile]			
Taurine	6890	220 - 1300	[Bar chart showing result at 50th percentile]			
Cystathionine	32	8 - 50	[Bar chart showing result at 50th percentile]			
Beta-alanine	250	< 20	[Bar chart showing result at 68th percentile]			95 th

UREA CYCLE METABOLITES						
	RESULT per creatinine	REFERENCE INTERVAL	PERCENTILE			
			2.5 th	16 th	50 th	84 th
Arginine	26 μmol/g	8 - 55	[Bar chart showing result at 50th percentile]			
Aspartate	6.7 μmol/g	6 - 33	[Bar chart showing result at 50th percentile]			
Citrulline	3.4 μmol/g	1 - 30	[Bar chart showing result at 50th percentile]			
Ornithine	21 μmol/g	3 - 45	[Bar chart showing result at 50th percentile]			
Urea	700 mmol/g	150 - 590	[Bar chart showing result at 50th percentile]			
Ammonia (NH ₄)	25200 μmol/g	12000 - 49000	[Bar chart showing result at 50th percentile]			
Glutamine	180 μmol/g	155 - 650	[Bar chart showing result at 50th percentile]			
Asparagine	32 μmol/g	35 - 200	[Bar chart showing result at 50th percentile]			

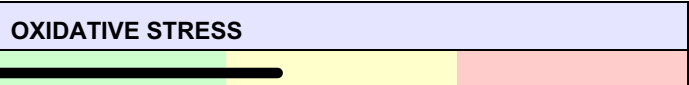
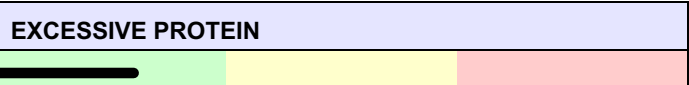
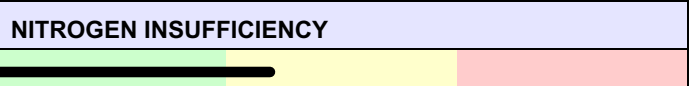
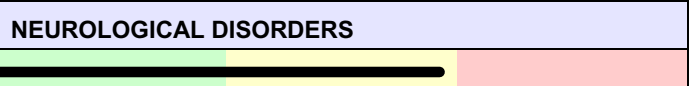
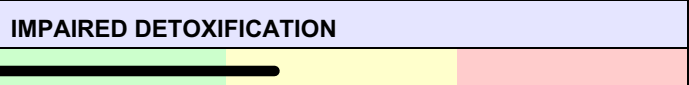
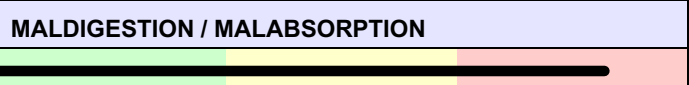
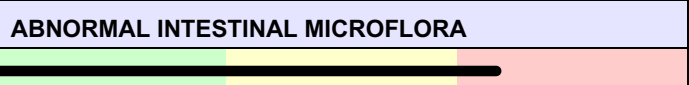
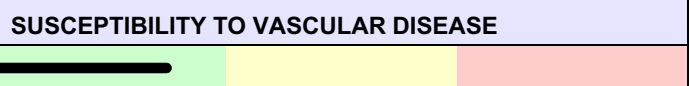
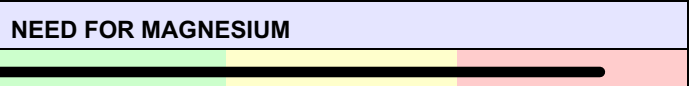
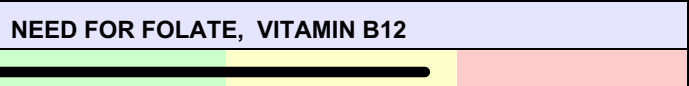
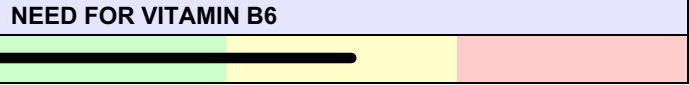
OTHER						
	RESULT	REFERENCE INTERVAL	PERCENTILE			
			2.5 th	16 th	50 th	84 th
Creatinine	43 mg/dL	30 - 225	[Bar chart showing result at 50th percentile]			



SUPPLEMENTATION SCHEDULE

A patient-specific Amino Acid Supplement Schedule cannot be calculated because the patient's body weight was not provided on the requisition form. Body weight is an essential variable in this calculation. To receive a suggested supplement schedule for this patient, please contact Doctor's Data Customer Service Department at 1-800-323-2784 or 1-630-377-8139 and provide the patient's body weight. An amino acid supplement schedule will then be calculated and a new report will be issued.

PRESUMPTIVE NEEDS / IMPLIED CONDITIONS



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:

$\text{CreatinineN (Normalized)} = \text{creatinine concentration} \times (1.73/\text{BSA}).$

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.

Phenylalanine (low)

Phenylalanine, an essential amino acid, is low in this urine specimen. Phenylalanine is required for the synthesis of proteins and is the precursor of tyrosine. Tyrosine is required for the production of neurotransmitters (eg. dopamine, DOPA, epinephrine) and, thyroid hormone. Phenylalanine is typically low as a result of unbalanced protein in the diet or gastrointestinal dysfunction, particularly hypochlorhydria. Phenylalanine is often low in patients with endogenous depression. Soy protein, legumes/lentils, cheese, nuts and shellfish are good dietary sources of phenylalanine.

Tryptophan (low)

Tryptophan, an essential amino acid, is low in this urine specimen. Tryptophan is the precursor of niacin and serotonin (vasoconstrictor and neurotransmitter). Low serotonin is often associated with disturbed sleep cycle or insomnia, anxiety or depression, aggressive behavior and low pain threshold. Tryptophan can be low as a result of low quality/quantity protein intake or intestinal malabsorption (eg. hypochlorhydria). Bacterial action on unabsorbed tryptophan in the intestine produces elevated levels of mildly toxic indole compounds such as indican ("blue diaper syndrome" in infants). A Comprehensive Stool Analysis may be warranted if dietary intake of protein appears to be adequate. Foods that are good sources of tryptophan include turkey, wild game, pork, soy protein, sunflower seeds, and cheeses.

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.

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.

Alanine (low)

Alanine, a nonessential amino acid, is low in this urine specimen. Alanine is an abundant amino acid that is typically low with poor dietary habits or protein malnutrition. Gross protein malnutrition is rarely the result of maldigestion but rather the result of insufficient dietary protein/calories. Alanine is a primary source of glucose (gluconeogenesis) with caloric insufficiency (eg. anorexia, bulimia). Check for low urinary levels of essential amino acids, ammonia, urea and creatinine and hypoglycemia.

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.

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.

Anserine (high)

Anserine, a dietary peptide is high in this urine specimen. Anserine is an incompletely digested peptide that is derived primarily from poultry, duck, rabbit, tuna and salmon. Anserine consists of 1-methylhistidine and beta-alanine. Breakdown of the peptide requires a zinc dependent peptidase, which can be inhibited by high levels of the "end product" beta-alanine. Beta-alanine can accumulate if deamination of beta-alanine to alpha-ketoglutarate is impaired due to B-6 insufficiency. Therefore anserine can accumulate as a result of high intake of anserine containing protein with insufficient zinc and/or B-6 availability. Beta-alanine can also be elevated as a product of gastrointestinal bacterial conversion of aspartate and/or breakdown of pyrimidines that are high in yeast. Thus beta-alanine can accumulate and inhibit hydrolysis of anserine as a result of significant dysbiosis, or deficiencies of B-6 and/or zinc. Beta-alanine can have adverse effects in the central nervous system but, more commonly elevated levels of beta-alanine inhibit renal conservation of the amino acid taurine which is an important antioxidant, neurotransmitter and, essential for the retention and metabolism of intracellular magnesium and potassium. If urinary taurine is either low or high, magnesium deficiency is likely or pending. Comprehensive Stool Analysis (yeast/bacteria), Red Blood Cell Elements analysis (zinc, potassium, and magnesium) and assessment of B-6 status are useful to identify the cause and potential consequences of the inability to breakdown this dietary peptide.

Phosphoethanolamine (low)

Phosphoethanolamine, a nonessential phosphorous bearing amino acid, is low in this urine specimen. Phosphoethanolamine is derived from dietary sources and is also formed endogenously from serine via phosphorylation of ethanolamine. When ethanolamine is high or normal and phosphoethanolamine is low there is a presumptive need for magnesium (magnesium dependent kinase). Phosphoethanolamine is a precursor of phosphotidyl choline, choline and the neurotransmitter acetylcholine. If low phosphoethanolamine results in low acetylcholine, and there is insufficient choline from dietary lecithin, there may be depressed activity of the parasympathetic nervous system (eg. decreased peristalsis, ability to sweat), and poor memory and cognitive function. Low phosphoethanolamine is usually the result of magnesium deficiency or protein malnutrition.

1-Methylhistidine (high)

1-methylhistidine is abnormally high in this urine specimen. 1-methylhistidine is abundant in poultry tuna and salmon and can be elevated if intake of these foods is excessive. A reduction in the intake of such dietary protein sources may be warranted, and supplemental B-12 and folic acid may be beneficial.

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.

Urea (high)

The level of urea in this urine specimen is higher than normal. Elevated urinary urea would be expected with excessive protein intake; this would be associated with high urinary levels of several amino acids and high blood urea nitrogen. Alternatively, urinary urea might be high in association with abnormal renal clearance (nephritis or toxicity); this might be associated with elevated urine creatinine, and low blood urea nitrogen.