The Great Plains Laboratory, Inc.

William Shaw, Ph.D., Director | 11813 West 77th Street, Lenexa, KS 66214 | (913) 341-8949 | Fax (913) 341-6207

Requisition #:	388366	***Physician:***	NO PHYSICIAN
Patient Name:	Natasha Gordon	***Date of Collection:***	5/25/2015
Patient Age:	41	***Time of Collection:***	06:37 AM
Patient Sex:	F	***Print Date:***	06/01/2015

Organic Acids Test - Nutritional and Metabolic Profile

Metabolic Markers in Urine	Reference Range *(mmol/mol creatinine)*		Patient Value	Reference Population - Females Age 13 and Over
Intestinal Microbial Overgrowth				
Yeast and Fungal Markers				
1 Citramalic	≤ 3.6		0.57	0.57
2 5-Hydroxymethyl-2-furoic	≤ 14		0.16	0.16
3 3-Oxoglutaric	≤ 0.33		0.10	0.10
4 Furan-2,5-dicarboxylic	≤ 16		0.30	0.30
5 Furancarbonylglycine	≤ 1.9		0.12	0.12
6 Tartaric	≤ 4.5		0.26	0.26
7 Arabinose	≤ 29	H	38	38
8 Carboxycitric	≤ 29		4.0	4.0
9 Tricarballylic	≤ 0.44		0.16	0.16
Bacterial Markers				
10 Hippuric	≤ 613		428	428
11 2-Hydroxyphenylacetic	0.06 - 0.66		0.36	0.36
12 4-Hydroxybenzoic	≤ 1.3		0.41	0.41
13 4-Hydroxyhippuric	0.79 - 17		4.9	4.9
14 DHPPA (Beneficial Bacteria)	≤ 0.38		0.06	0.06
Clostridia Bacterial Markers				
15 4-Hydroxyphenylacetic *(C. difficile, C. stricklandii, C. lituseburense & others)*	≤ 19	H	21	21
16 HPHPA *(C. sporogenes, C. caloritolerans, C. botulinum & others)*	≤ 208		46	46
17 4-Cresol *(C. difficile)*	≤ 75		37	37
18 3-Indoleacetic *(C. stricklandii, C. lituseburense, C. subterminale & others)*	≤ 11		1.8	1.8

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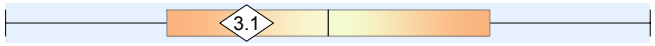
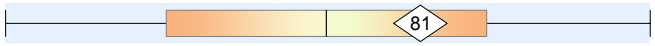
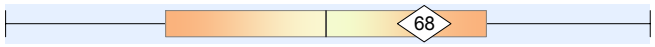
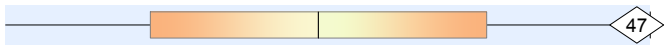
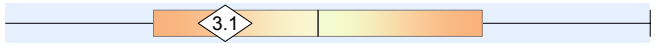
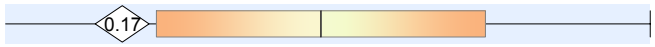
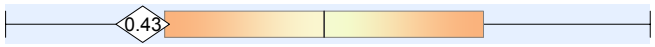
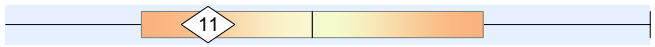
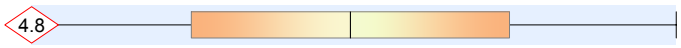
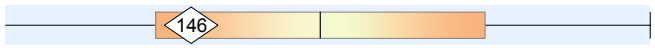
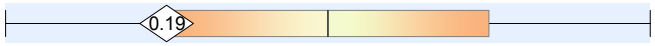
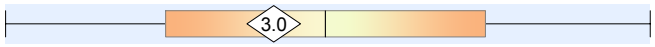
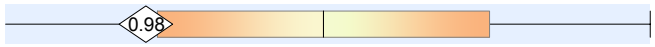
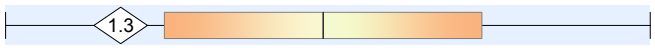
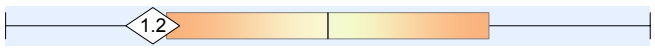
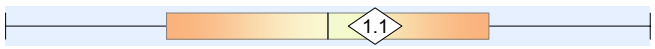
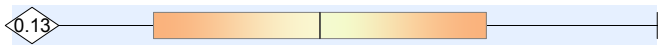
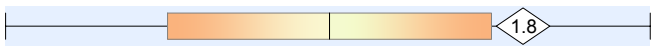
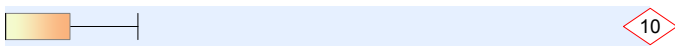
Patient Name:	Natasha Gordon	*Date of Collection:*	5/25/2015

Metabolic Markers in Urine		Reference Range (mmol/mol creatinine)		Patient Value		Reference Population - Females Age 13 and Over
Oxalate Metabolites						
19	Glyceric	0.77	- 7.0	3.1		
20	Glycolic	16	- 117	81		
21	Oxalic	6.8	- 101	68		
Glycolytic Cycle Metabolites						
22	Lactic		≤ 48	47		
23	Pyruvic		≤ 9.1	3.1		
Mitochondrial Markers - Krebs Cycle Metabolites						
24	Succinic		≤ 9.3	2.5		
25	Fumaric		≤ 0.94	0.17		
26	Malic	0.06	- 1.8	0.43		
27	2-Oxoglutaric		≤ 35	11		
28	Aconitic	6.8	- 28	4.8	L	
29	Citric		≤ 507	146		
Mitochondrial Markers - Amino Acid Metabolites						
30	3-Methylglutaric		≤ 0.76	0.19		
31	3-Hydroxyglutaric		≤ 6.2	3.0		
32	3-Methylglutaconic		≤ 4.5	0.98		
Neurotransmitter Metabolites						
Phenylalanine and Tyrosine Metabolites						
33	Homovanillic (HVA) *(dopamine)*	0.80	- 3.6	1.3		
34	Vanillylmandelic (VMA) *(norepinephrine, epinephrine)*	0.46	- 3.7	1.2		
35	HVA / VMA Ratio	0.16	- 1.8	1.1		
Tryptophan Metabolites						
36	5-Hydroxyindoleacetic (5-HIAA) *(serotonin)*		≤ 4.3	0.13		
37	Quinolinic	0.85	- 3.9	1.4		
38	Kynurenic	0.17	- 2.2	1.8		
39	Quinolinic / 5-HIAA Ratio	0.42	- 2.0	10	H	

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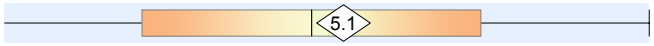
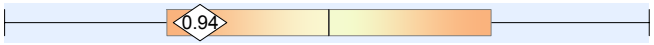
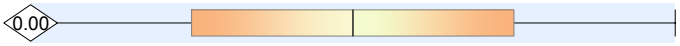
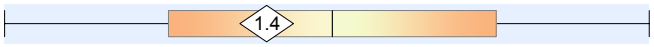
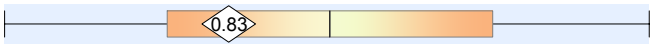
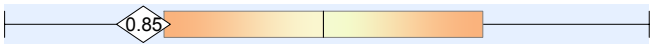
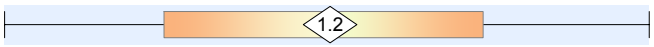
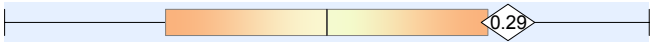
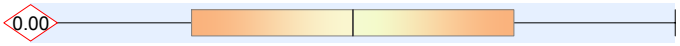
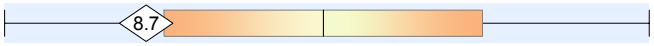
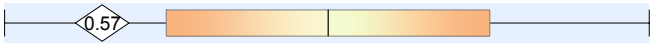
Patient Name:	Natasha Gordon	*Date of Collection:*	5/25/2015

Metabolic Markers in Urine		Reference Range *(mmol/mol creatinine)*	Patient Value	Reference Population - Females Age 13 and Over
Pyrimidine Metabolites - Folate Metabolism				
40	Uracil	≤ 9.7	5.1	
41	Thymine	≤ 0.56	0.31	
Ketone and Fatty Acid Oxidation				
42	3-Hydroxybutyric	≤ 3.1	0.94	
43	Acetoacetic	≤ 10	0	
44	4-Hydroxybutyric	≤ 4.8	1.4	
45	Ethylmalonic	0.44 - 2.8	1.4	
46	Methylsuccinic	0.10 - 2.2	0.83	
47	Adipic	0.04 - 3.8	0.85	
48	Suberic	0.18 - 2.2	1.2	
49	Sebacic	≤ 0.24	0.08	
Nutritional Markers				
Vitamin B12				
50	Methylmalonic ✱	≤ 2.3	0.14	
Vitamin B6				
51	Pyridoxic (B6)	≤ 34	1.0	
Vitamin B5				
52	Pantothenic (B5)	≤ 10	1.9	
Vitamin B2 (Riboflavin)				
53	Glutaric ✱	0.04 - 0.36	0.29	
Vitamin C				
54	Ascorbic	10 - 200 L	0	
Vitamin Q10 (CoQ10)				
55	3-Hydroxy-3-methylglutaric ✱	0.17 - 39	8.7	
Glutathione Precursor and Chelating Agent				
56	N-Acetylcysteine (NAC)	≤ 0.28	0.03	
Biotin (Vitamin H)				
57	Methylcitric ✱	0.19 - 2.7	0.57	

✱ ***A high value for this marker may indicate a deficiency of this vitamin.***

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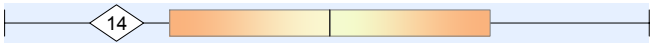
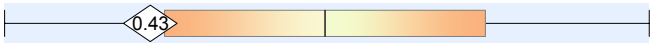
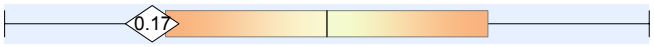
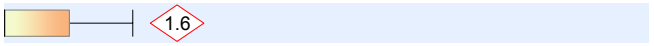
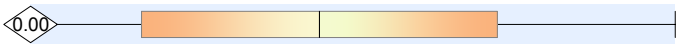
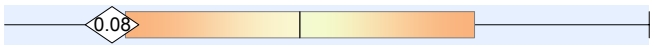
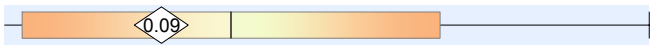
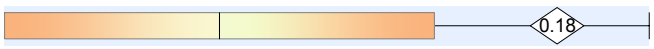
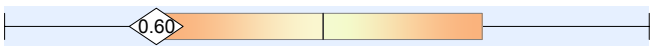
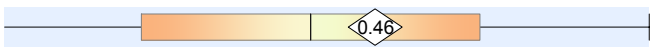
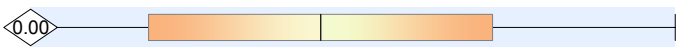
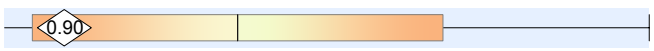
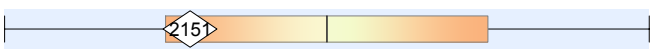
Requisition #:	388366	*Physician:*	NO PHYSICIAN
Patient Name:	Natasha Gordon	*Date of Collection:*	5/25/2015

Metabolic Markers in Urine		Reference Range *(mmol/mol creatinine)*			Patient Value	Reference Population - Females Age 13 and Over
Indicators of Detoxification						
Glutathione						
58	Pyroglutamic ✱	10	-	33	14	
59	2-Hydroxybutyric ✱	0.03	-	1.8	0.43	
Ammonia Excess						
60	Orotic	0.06	-	0.54	0.17	
Aspartame, salicylates, or GI bacteria						
61	2-Hydroxyhippuric		≤	1.3	H 1.6	

✱ ***A high value for this marker may indicate a Glutathione deficiency.***

Amino Acid Metabolites						
62	2-Hydroxyisovaleric		≤	0.42	0	
63	2-Oxoisovaleric		≤	2.1	0	
64	3-Methyl-2-oxovaleric		≤	0.87	0	
65	2-Hydroxyisocaproic		≤	0.48	0.08	
66	2-Oxoisocaproic		≤	0.37	0.09	
67	2-Oxo-4-methiolbutyric		≤	0.16	0.04	
68	Mandelic		≤	0.21	0.18	
69	Phenyllactic		≤	0.20	0	
70	Phenylpyruvic	0.20	-	1.9	0.60	
71	Homogentisic		≤	0.36	0.28	
72	4-Hydroxyphenyllactic		≤	0.80	0.46	
73	N-Acetylaspartic		≤	3.0	0	
74	Malonic		≤	9.7	0.90	
Mineral Metabolism						
75	Phosphoric	1 000	-	5 000	2 151	

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Patient Name:	Natasha Gordon	*Date of Collection:*	5/25/2015

Indicator of Fluid Intake

76	*Creatinine	88	mg/dL

*The creatinine test is performed to adjust metabolic marker results for differences in fluid intake. Urinary creatinine has limited diagnostic value due to variability as a result of recent fluid intake. Samples are rejected if creatinine is below 20 mg/dL unless the client requests results knowing of our rejection criteria.

Explanation of Report Format

The reference ranges for organic acids were established using samples collected from typical individuals of all ages with no known physiological or psychological disorders. The ranges were determined by calculating the mean and standard deviation (SD) and are defined as ± 2SD of the mean. Reference ranges are age and gender specific, consisting of Male Adult (≥13 years), Female Adult (≥13 years), Male Child (<13 years), and Female Child (<13 years).

There are two types of graphical representations of patient values found in the new report format of both the standard Organic Acids Test and the Microbial Organic Acids Test.

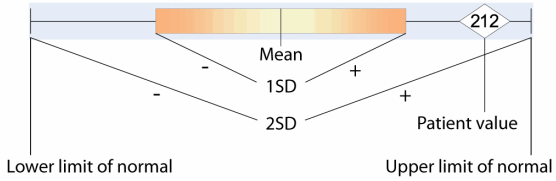
The first graph will occur when the value of the patient is within the reference (normal) range, defined as the mean plus or minus two standard deviations.

The second graph will occur when the value of the patient exceeds the upper limit of normal. In such cases, the graphical reference range is "shrunk" so that the degree of abnormality can be appreciated at a glance. In this case, the lower limits of normal are not shown, only the upper limit of normal is shown.

In both cases, the value of the patient is given to the left of the graph and is repeated on the graph inside a diamond. If the value is within the normal range, the diamond will be outlined in black. If the value is high or low, the diamond will be outlined in red.

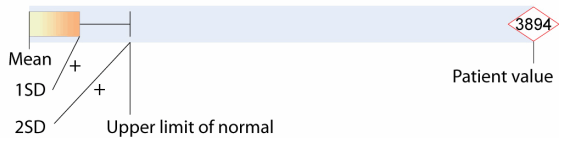
Example of Value Within Reference Range

Metabolic Markers in Urine	Reference Range (mmol/mol creatinine)		Patient Result	Reference Range - Males Age 13 and Under
Intestinal Microbial Overgrowth				
HPHPA (Clostridia marker)	<	219 .9	212	

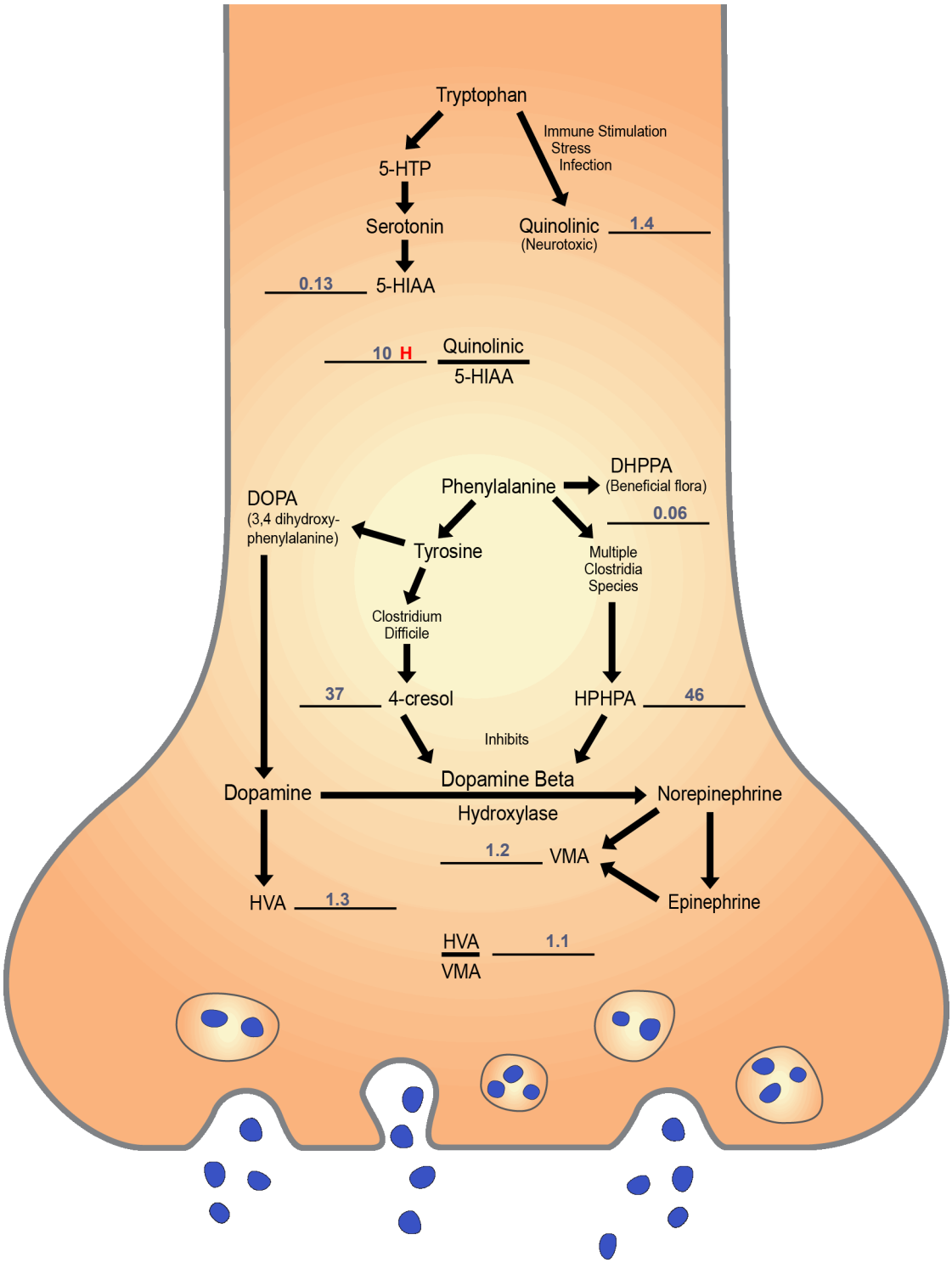


Example of Elevated Value

Metabolic Markers in Urine	Reference Range (mmol/mol creatinine)		Patient Result	Reference Range - Males Age 13 and Under
Intestinal Microbial Overgrowth				
HPHPA (Clostridia marker)	<	219 .9	H 3894	



Neurotransmitter Metabolism Markers



The diagram contains the patient's test results for neurotransmitter metabolites and shows their relationship with key biochemical pathways within the axon terminal of nerve cells. The effect of microbial byproducts on the blockage of the conversion of dopamine to norepinephrine is also indicated.

Interpretation

High yeast/fungal metabolites (Markers 1,2,3,4,5,6,7,8) indicate a yeast/fungal overgrowth of the gastrointestinal tract. Prescription or natural (botanical) anti-fungals, along with supplementation of high potency multi-strain probiotics (20-50 billion cfu's), may reduce yeast/fungal levels.

High 4-hydroxyphenylacetic acid (Marker 15) is associated with small intestinal bacteria overgrowth due to its production by the following Clostridia bacteria: *C. difficile, C. stricklandii, C. lituseburense, C. subterminale, C. putrefaciens,* and *C. propionicum. C. difficile* can be distinguished from the other species by its production of 4-cresol which none of the other species produce. No information on the pathogenicity of the other species producing 4-hydroxyphenylacetic acid is available. It is likely that the phenol 4-hydroxyphenylacetic is an inhibitor of dopamine-beta-hydroxylase and that patients with high values may have elevated dopamine and HVA /VMA ratios. Elevated values are common in celiac disease and cystic fibrosis and have been reported as elevated in jejuna web, transient lactose intolerance, Giardia infection, ileal resection, ileocolic intussusception, septicemia, and projectile vomiting. Treatment with probiotics or antibiotics may be clinically useful.

Extremely elevated levels of at least 100 mmol/mol creatinine are associated with tyrosinemia, which can be due to immature development of enzymes in infants or to genetic deficiencies.

HVA levels below the mean (Marker 33) may indicate lower production of the neurotransmitter dopamine, perhaps due to low dietary intake of the amino acid precursors phenylalanine or tyrosine. Homovanillic acid is a metabolite of the neurotransmitter dopamine. Supplementation with phenylalanine or tyrosine may be beneficial. Enzyme cofactors magnesium, B6 (pyridoxine) or biopterin may also be deficient; neurotransmitter levels may increase with supplementation with these cofactors if these are deficient.

VMA levels below the mean (Marker 34) may indicate lower production of the neurotransmitter norepinephrine or the hormone adrenaline, perhaps due to low dietary intake of the amino acid precursors phenylalanine or tyrosine. Vanylmandelic acid (VMA) is a metabolite of norepinephrine or adrenaline. Low VMA may also result from blocked conversion of dopamine to norepinephrine by *Clostridia* metabolites. Supplementation with phenylalanine or tyrosine may be beneficial. Enzyme cofactors magnesium, B6 (pyridoxine) or biopterin may also be deficient and respond to supplementation.

5-hydroxyindoleacetic acid (5-HIAA) levels below the mean (Marker 36) may indicate lower production of the neurotransmitter serotonin. 5-hydroxy-indoleacetic acid is a metabolite of serotonin. Low values have been correlated with symptoms of depression. Supplementation with the precursor 5- HTP (5-hydroxytryptophan) at 50-300 mg/day may be beneficial. Supplementation with tryptophan itself may form the neurotoxic metabolite quinolinic acid, however, 5- HTP is not metabolized to quinolinic acid. Excessive tryptophan supplementation has been associated with eosinophilia myalgia syndrome.

High quinolinic acid / 5-HIAA ratio (Marker 39) indicates an imbalance of these organic acids and may be a sign of neural excitotoxicity. Quinolinic acid is an excitotoxic stimulant of certain brain cells that have NMDA-type receptors. Overstimulated nerve cells may die. Brain toxicity due to quinolinic acid has been implicated in Alzheimer's disease, autism, Huntington's disease, stroke, dementia of old age, depression, HIV-associated dementia, and schizophrenia. However, quinolinic acid is derived from the amino acid tryptophan and is an important intermediate that the body uses to make the essential nutritional cofactor nicotinamide adenine dinucleotide (NAD), which can also be derived from niacin (B3).

An elevated ratio is not specific for a particular medical condition and is commonly associated with excessive inflammation due to recurrent infections. If quinolinic acid is not elevated, low 5-HIAA from serotonin may be the source of the imbalance. Supplementation with 5-HTP may increase serotonin levels, but 5-HTP is not metabolized to quinolinic acid. Immune overstimulation, excess adrenal production of cortisol due to stress, or high exposure to phthalates may also increase the quinolinic acid/5-HIAA acid ratio.

The drug deprenyl or the dietary supplements carnitine, melatonin, capsaicin, turmeric (curcumin) and garlic may reduce brain damage caused by quinolinic acid. Niacin (nicotinic acid) and niacinamide may also reduce quinolinic acid production by decreasing tryptophan shunting to the quinolinic acid pathway. Inositol hexaniacinate as an adult dose of 500-1000 mg does not cause niacin flush.

Pyridoxic acid (B6) levels below the mean (Marker 51) may be associated with less than optimum health conditions (low intake, malabsorption, or dysbiosis). Supplementation with B6 (20 - 50 mg/day) or a multivitamin may be beneficial.

Pantothenic acid (B5) levels below the mean (Marker 52) may be associated with less than optimum health conditions. Supplementation with B5 (250 mg/day) or a multivitamin may be beneficial.

Ascorbic acid (vitamin C) levels below the mean (Marker 54) may indicate a less than optimum level of the antioxidant vitamin C. Suggested supplementation is 1000 mg/day of buffered vitamin C, divided into 2-3 doses.

High 2-hydroxyhippuric acid (Marker 61) may result after ingestion of aspartame (Nutrasweet®) or salicylates (aspirin), or from GI bacteria converting tyrosine or phenylalanine to salicylic acid. 2-Hydroxyhippuric acid is a conjugate of hydroxybenzoic acid (salicylic acid) and glycine.

Low citramalic, 2-hydroxyphenylacetic, 4-hydroxyphenylacetic, 4-hydroxybenzoic, 4-hydroxyhippuric, 3-indoleacetic, glyceric, glycolic, oxalic, lactic, pyruvic, 2-hydroxybutyric, fumaric, malic, aconitic, quinolinic, kynurenic, quinolinic/5-HIAA ratio, thymine, ethylmalonic, methylsuccinic, adipic, suberic, glutaric, 3-hydroxy-3-methylglutaric, methylcitric, or orotic values have no known clinical significance.

Low values for amino acid metabolites (Markers 62-74) indicate the absence of genetic disorders of amino acid metabolism. These markers are deamination (ammonia removed) byproducts that are very elevated only when a key enzyme has low activity; slight elevations may indicate a genetic variation or heterozygous condition which may be mitigated with diet or supplementation. Low values are not associated with inadequate protein intake and have not been proven to indicate specific amino acid deficiencies.

High quality nutritional supplements can be purchased through your practitioner or at New Beginnings Nutritionals, www.NBNUS.com <http://www.NBNUS.com> , or call 877-575-2467.