GENOVA DIAGNOSTICS
3425 Corporate Way
Duluth, GA 30096

ION INDIVIDUAL • OPTIMAL • NUTRITIONAL

Patient: **SAMPLE PATIENT**
DOB:
Sex:
MRN:

3102 ION® Profile with Amino Acids 40 - Blood/Urine

Amino Acids 40 Profile - Plasma

Methodology: High Performance Liquid Chromotography

Ranges: Ages 13 and over.

	Results µmol/L		QUINTILE DISTRIBUTION (1st / 2nd / 3rd / 4th / 5th)	95% Reference Range
Essential Amino Acids				
Limiting Amino Acids				
1. Lysine	200		147 – 263	120 - 318
2. Methionine	14		17 – 34	14 - 48
3. Tryptophan	25	L	39 – 69	31 - 83
Branched Chain Amino Acids				
4. Isoleucine	30	L	40 – 82	35 - 104
5. Leucine	57	L	87 – 164	74 - 196
6. Valine	159		167 – 316	146 - 370
Other Essential Amino Acids				
7. Phenylalanine	42		48 – 77	42 - 95
8. Histidine	62		63 – 97	57 - 114
9. Threonine	100		88 – 172	73 - 216
Conditionally Essential Amino Acids				
10. Arginine	69		43 – 107	29 - 137
11. Taurine	89		36 – 99	29 - 136
12. Glycine	600	H	192 – 418	155 - 518
13. Serine	94		74 – 139	60 - 172

Amino Acids 40 Profile - Plasma

Methodology: High Performance Liquid Chromotography

Ranges: Ages 13 and over.

	Results µmol/L		QUINTILE DISTRIBUTION 1st 2nd 3rd 4th 5th	95% Reference Range
Functional Categories				
Vitamin B6 Status Markers				
14. α-aminoadipic acid	0.7		0.5	<= 1.5
15. α-Amino-n-butyric acid (α-ANB)	20		28	<= 39
16. γ-aminobutyric acid (GABA)	0.7		0.6	<= 1.5
17. Cystathionine	<0.3		0.3	<= 0.3
Vascular Function				
18. Arginine	69		43 107	29 - 137
19. Taurine	89		36 99	29 - 136
20. α-aminoadipic acid	0.7		0.5	<= 1.5
Neurotransmitters and Precursors				
21. Phenylalanine	42		48 77	42 - 95
22. Tyrosine	60		45 87	38 - 110
23. Tryptophan	25	L	39 69	31 - 83
24. Glutamic Acid	250	H	33 136	24 - 214
25. Taurine	89		36 99	29 - 136
Sulfur Amino Acids (Glutathione - related)				
26. Methionine	14		17 34	14 - 48
27. Cystathionine	<0.3		0.3	<= 0.3
28. Homocystine	<0.6		0.6	<= 0.6
29. Cystine	13.0		1.6 16.3	0.8 - 27.5
30. Taurine	89		36 99	29 - 136

Amino Acids 40 Profile - Plasma

Methodology: High Performance Liquid Chromotography

Ranges: Ages 13 and over.

	Results µmol/L		QUINTILE DISTRIBUTION 1st 2nd 3rd 4th 5th	95% Reference Range
Functional Categories				
Urea Cycle and Ammonia Detoxification				
31. Arginine	69		43 107	29 - 137
32. Citrulline	70	H	22 45	18 - 57
33. Ornithine	45		36 86	28 - 117
34. Glutamine	500		458 771	372 - 876
35. Asparagine	25	L	39 71	31 - 90
36. Aspartic Acid	13.1	H	3.5 8.6	2.9 - 12.6
Glycine, Serine and Related Amino Acids				
37. Alanine	350		284 559	230 - 681
38. Glycine	600	H	192 418	155 - 518
39. Sarcosine	10.0		12.1	<= 19.5
40. Serine	94		74 139	60 - 172
41. Phosphoserine	<0.5		0.5	<= 0.8
42. Ethanolamine	6.0		9.3	<= 11.6
43. Phosphoethanolamine	3.2		4.6	<= 7.4
Collagen - Related Amino Acids				
44. Proline	180		119 279	99 - 363
45. Hydroxyproline	13		16	<= 26
46. Lysine	200		147 263	120 - 318
47. Hydroxylysine	0.6		0.6	<= 0.6

Amino Acids 40 Profile - Plasma

Methodology: High Performance Liquid Chromotography

Ranges: Ages 13 and over.

	Results µmol/L		QUINTILE DISTRIBUTION 1st 2nd 3rd 4th 5th	95% Reference Range
Functional Categories				
β -Amino Acids and Derivatives				
48. β-Alanine	2.5		2.8	<= 5.0
49. Histidine	62		63 97	57 - 114
50. Carnosine	2.6		4.8	<= 6.3
51. 1-Methylhistidine	5.0		7.2	<= 9.8
52. Anserine	20		36	<= 43
DNA (Thymine) Degradation				
53. β-Aminoisobutyric Acid	1.6		1.5	<= 3.2
Muscle-Specific Amino Acids				
54. 3-Methylhistidine	25		37	<= 52
Ratios				
55. Phenylalanine/Tyrosine	0.70			<= 1.10
56. Glutamic Acid/Glutamine	0.50	H	0.07 0.17	0.06 - 0.23
57. Hydroxyproline/Proline	0.072			<= 0.152
58. α-ANB/Leucine	0.35	H		<= 0.22
59. Tryptophan/LNAA*	0.072	L	0.096 0.101	0.090 - 0.102

*Large neutral amino acids (Leu+Ile+Val+Phe+Tyr)

NR = Not Reportable

	Results	QUINTILE DISTRIBUTION (1st / 2nd / 3rd / 4th / 5th)	95% Reference Range

Homocysteine Assay - Plasma

Methodology: Enzymatic Assay

Ranges: Ages 13 and over.

1.	Homocysteine	20.7	H	4.0 – 10.0	3.0 - 14.0 nmol/mL

Nutrient & Toxic Elements Profile - Blood

Methodology: Inductively Coupled Plasma/Mass Spectrometry

Nutrient Elements

Erythrocytes (packed cells)

1.	Potassium	2,519		2,672	2,303 - 3,374 ppm
2.	Magnesium	38		44	34 - 63 ppm
3.	Calcium*	31		44	24 - 65 ppm

Plasma

4.	Zinc	782		815	643 - 1,594 ppb
5.	Copper	952		929	753 - 1,920 ppb

Whole Blood

6.	Selenium	0.17		0.16	0.13 - 0.32 ppm

Toxic Elements

Whole Blood

7.	Aluminum	26		45	<= 113 ppb
8.	Arsenic	11.5	H	5.1	<= 10.0 ppb
9.	Cadmium	0.21		0.60	<= 1.10 ppb
10.	Lead	22		18	<= 29 ppb
11.	Mercury	3.8		4.3	<= 9.8 ppb

*Relevant to membrane permeability, not nutritional status.

Results for whole blood toxic elements that are within normal limits do not rule out metal accumulation in other tissues.

NR = Not Reportable

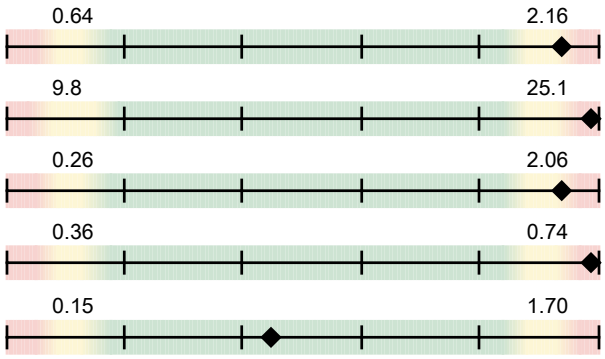
QUINTILE DISTRIBUTION: 1st | 2nd | 3rd | 4th | 5th

Coenzyme Q10 Plus Vitamins Profile - Serum

Methodology: High Performance Liquid Chromotography

Ranges: Ages 13 and over.

		Results mg/L		95% Reference Range
1.	Coenzyme Q10	2.73		0.48 - 3.04
2.	alpha-Tocopherol	42.6	H	6.8 - 31.7
3.	gamma-Tocopherol	2.19		0.06 - 2.99
4.	Vitamin A (Retinol)	1.39	H	0.29 - 1.05
5.	β-Carotene	0.47		0.10 - 2.71



Lipid Peroxides Assay - Serum

Methodology: High Performance Liquid Chromotography

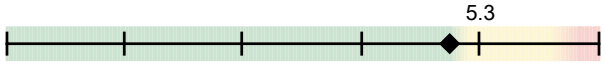
		Results nmol/mL	95% Reference Range
6.	Lipid Peroxides	1.47	<= 2.60

DNA/Oxidative Stress Marker (8-OHdG) Assay - Urine

Methodology: LC/Tandem Mass Spectrometry, Colorimetric

Ranges: Ages 13 and over.

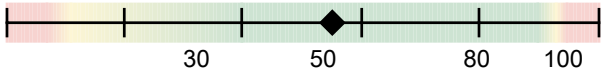
		Results ng/mg creatinine	95% Reference Range
7.	8-Hydroxy-2-deoxyguanosine	4.9	<= 7.6



Vitamin D Profile - Serum

Methodology: LC/Tandem Mass Spectrometry

		Results ng/mL	Reference Range
8.	25-Hydroxyvitamin D	57.1	30.0 - 100.0
9.	25-Hydroxyvitamin D2	<0.1	
10.	25-Hydroxyvitamin D3	57.0	



Total 25-Hydroxyvitamin D is considered the best assessment of vitamin D status. The test reflects vitamin D from all sources (diet, supplements, and sun exposure).

Conversion factors: nmol/L = ng/mL x 2.5 | ng/mL = nmol/L x 0.4

<DL = less than detection limit

NR = Not Reportable

Fatty Acids Profile - Plasma

Methodology: Capillary Gas Chromatography/Mass Spectrometry

Ranges: Ages 13 and over

		Results µmol/L	QUINTILE DISTRIBUTION 1st 2nd 3rd 4th 5th	95% Reference Range
Polyunsaturated Omega-3				
1.	Alpha Linolenic (18:3n3)	25	20	13 - 80
2.	Eicosapentaenoic (20:5n3)	29	17	5 - 210
3.	Docosapentaenoic (22:5n3)	21	16	11 - 50
4.	Docosahexaenoic (22:6n3)	110	59	31 - 213
Polyunsaturated Omega-6				
5.	Linoleic (18:2n6)	1,275	930 1,669	821 - 2,032
6.	Gamma Linolenic (18:3n6)	5	7 33	5 - 46
7.	Eicosadienoic (20:2n6)	12.3	6.4 15.3	5.2 - 22.5
8.	Dihomogamma Linolenic (20:3n6)	39	34 102	27 - 140
9.	Arachidonic (20:4n6)	299	201 451	158 - 521
10.	Docosadienoic (22:2n6)	0.8	0.9	<= 2.0
11.	Docosatetraenoic (22:4n6)	5.3	3.7 13.8	2.6 - 18.1
Polyunsaturated Omega-9				
12.	Mead (20:3n9)	2.3	5.3	<= 8.3
Monounsaturated				
13.	Myristoleic (14:1n5)	1.9	1.2 6.1	0.8 - 9.7
14.	Palmitoleic (16:1n7)	52	40 155	30 - 256
15.	Vaccenic (18:1n7)	71	48 93	40 - 122
16.	Oleic (18:1n9)	1,058	555 1,182	466 - 1,470
17.	11-Eicosenoic (20:1n9)	7.6	4.6 10.3	3.7 - 18.1
18.	Nervonic (24:1n9)	1.9	1.1 2.2	1.1 - 2.7

Fatty Acids Profile - Plasma

Methodology: Capillary Gas ChromatographyMass Spectrometry

Ranges: Ages 13 and over

		Results µmol/L		QUINTILE DISTRIBUTION (1st | 2nd | 3rd | 4th | 5th)	95% Reference Range
Saturated					
19.	Capric (10:0)	1.3		1.4 – 4.0	0.8 - 6.2
20.	Lauric (12:0)	4.7		3.3 – 14.5	2.2 - 27.3
21.	Myristic (14:0)	26		20 – 87	15 - 139
22.	Palmitic (16:0)	1,339		792 – 1,794	667 - 2,526
23.	Stearic (18:0)	545		294 – 511	250 - 629
24.	Arachidic (20:0)	3.0		1.5 – 3.2	1.3 - 4.7
25.	Behenic (22:0)	0.9		0.8 – 2.0	0.6 - 2.9
26.	Lignoceric (24:0)	1.31		0.84 – 1.66	0.63 - 2.45
27.	Hexacosanoic (26:0)	0.35		0.36	<= 0.43
Odd Chain					
28.	Pentadecanoic (15:0)	9.5		14.5	<= 20.6
29.	Heptadecanoic (17:0)	18.3		19.3	<= 24.4
30.	Nonadecanoic (19:0)	1.83		1.51	<= 1.89
31.	Heneicosanoic (21:0)	0.38		0.50	<= 0.74
32.	Tricosanoic (23:0)	0.80	H	0.62	<= 0.78
Trans					
33.	Palmitelaidic (16:1n7t)	1.0		0.4	<= 1.8
34.	Total C:18 Trans	21		42	<= 59
Ratios					
35.	LA/DGLA	33		30	11 - 46
36.	EPA/DGLA	0.74		0.24	0.07 - 5.98
37.	AA/EPA	10		20	1 - 57
38.	Triene/Tetraene	0.008		0.016	<= 0.023

NR = Not Reportable

Organix® Comprehensive Profile - Urine

Methodology: LC/Tandem Mass Spectrometry, Colorimetric

This report is not intended for the diagnosis of neonatal inborn errors of metabolism.

Ranges: Ages 13 and over

		Results mcg/mg creatinine		QUINTILE DISTRIBUTION 1st 2nd 3rd 4th 5th	95% Reference Range
Nutrient Markers					
Fatty Acid Metabolism *(Carnitine & B2)*					
1.	Adipate	7.8		6.2	<= 11.1
2.	Suberate	0.9		2.1	<= 4.6
3.	Ethylmalonate	7.9	H	3.6	<= 6.3
Carbohydrate Metabolism *(B1, B3, Cr, Lipoic Acid, CoQ10)*					
4.	Pyruvate	<DL		3.9	<= 6.4
5.	L-Lactate	8.6		8.5	0.6 - 16.4
6.	β-Hydroxybutyrate	2.5		2.1	<= 9.9
Energy Production (Citric Acid Cycle) *(B comp., CoQ10, Amino Acids, Mg)*					
7.	Citrate	570		601	56 - 987
8.	Cis-Aconitate	35		51	18 - 78
9.	Isocitrate	91		98	39 - 143
10.	α-Ketoglutarate	<DL		19.0	<= 35.0
11.	Succinate	21.0	H	11.6	<= 20.9
12.	Fumarate	<DL		0.59	<= 1.35
13.	Malate	1.1		1.4	<= 3.1
14.	Hydroxymethylglutarate	3.6		3.6	<= 5.1
B-Complex Vitamin Markers *(B1, B2, B3, B5, B6, Biotin)*					
15.	α-Ketoisovalerate	<DL		0.25	<= 0.49
16.	α-Ketoisocaproate	<DL		0.34	<= 0.52
17.	α-Keto-β-Methylvalerate	<DL		0.38	<= 1.10
18.	Xanthurenate	<DL		0.34	<= 0.46
19.	β-Hydroxyisovalerate	4.5		7.6	<= 11.5

Organix® Comprehensive Profile - Urine

Methodology: LC/Tandem Mass Spectrometry, Colorimetric

This report is not intended for the diagnosis of neonatal inborn errors of metabolism.

Ranges: Ages 13 and over

		Results mcg/mg creatinine	QUINTILE DISTRIBUTION 1st 2nd 3rd 4th 5th	95% Reference Range
Nutrient Markers				
Methylation Cofactor Markers *(B12, Folate)*				
20.	Methylmalonate	0.6	1.7	<= 2.3
21.	Formiminoglutamate	0.5	1.2	<= 2.2
Cell Regulation Markers				
Neurotransmitter Metabolism Markers *(Tyrosine, Tryptophan, B6, Antioxidants)*				
22.	Vanilmandelate	3.8	1.6 3.9	1.2 - 5.3
23.	Homovanillate	4.3	1.9 5.7	1.4 - 7.6
24.	5-Hydroxyindoleacetate	6.8	2.1 5.6	1.6 - 9.8
25.	Kynurenate	1.1	1.0	<= 1.5
26.	Quinolinate	2.6	4.0	<= 5.8
27.	Picolinate	5.6	8.0	2.8 - 13.5
Oxidative Damage and Antioxidant Markers *(Vitamin C and Other Antioxidants)*				
28.	p-Hydroxyphenyllactate	0.47	0.39	<= 0.66
29.	8-Hydroxy-2-deoxyguanosine	4.9	5.3	<= 7.6
Toxicants and Detoxification				
Detoxification Indicators *(Arg, NAC, Met, Mg, Antioxidants)*				
30.	2-Methylhippurate	0.111	0.084	<= 0.192
31.	Orotate	0.57	0.69	<= 1.01
32.	Glucarate	9.9	6.3	<= 10.7
33.	α-Hydroxybutyrate	<DL	0.3	<= 0.9
34.	Pyroglutamate	67	59	28 - 88
35.	Sulfate	1,531	958 2,347	690 - 2,988

(Units for 8-hydroxy-2-dexoyguanosine are ng/mg creatinine)

Organix® Comprehensive Profile - Urine

Methodology: LC/Tandem Mass Spectrometry, Colorimetric

This report is not intended for the diagnosis of neonatal inborn errors of metabolism.

Ranges: Ages 13 and over

		Results mcg/mg creatinine		QUINTILE DISTRIBUTION 1st 2nd 3rd 4th 5th	95% Reference Range
Compounds of Bacterial or Yeast/Fungal Origin					
Bacterial - General					
36.	Benzoate	<DL		0.6	<= 9.3
37.	Hippurate	709		548	<= 1,070
38.	Phenylacetate	0.17		0.11	<= 0.18
39.	Phenylpropionate	<DL			<= 0.06
40.	p-Hydroxybenzoate	0.5		1.1	<= 1.8
41.	p-Hydroxyphenylacetate	10		19	<= 34
42.	Indican	93	H	64	<= 90
43.	Tricarballylate	<DL		0.73	<= 1.41
L. acidophilus / General Bacterial					
44.	D-Lactate	0.2		2.0	<= 4.1
Clostridial Species					
45.	3,4-Dihydroxyphenylpropionate	<DL			<= 0.05
Yeast / Fungal					
46.	D-Arabinitol	40		36	<= 73

Creatinine = 48 mg/dL

<DL = less than detection limit
>UL = greater than upper linearity limit
NR = Not Reportable

Commentary

The performance characteristics of all assays have been verified by Genova Diagnostics, Inc. Unless otherwise noted with ◆, the assay has not been cleared by the U.S. Food and Drug Administration.

3102 ION® Profile with Amino Acids 40 - Blood/Urine

ION Analyte Pattern Analysis

A multi-analyte report can provide greater insight about health risks and special nutrient needs. Patterns of abnormalities can reinforce the degree of significance indicated by a single measurement. Analytes from the various profiles in the ION report are combined below into categories associated with clinical/metabolic conditions.

The categories included cover the most common areas of concern relevant to these profiles. Above each thermometer are listed the analytes used to calculate the degree of significance. An ↑ or ↓ appears when the patient result is outside the fourth quintile of the population.

The thermometer advances to the right as the number and severity of relevant abnormalities increases. The longer the filled bar, the greater the degree of significance or likelihood that a health threat may exist in that category. The preceeding laboratory results provide the detail upon which these thermometers are based.

Cardiovascular System

Arginine	Homocysteine ↑	Calcium	Magnesium ↓
Coenzyme Q10	alpha-Tocopherol	gamma-Tocopherol	Lipid Peroxides
8-OHdG*	AA/EPA		

Low Significance High Significance

Fatigue

Isoleucine ↓	Leucine ↓	Phenylalanine ↓	Valine ↓
Magnesium ↓	Coenzyme Q10	Adipate ↑	Suberate
α-Ketoglutarate	Succinate ↑	Malate	Xanthurenate
Methylmalonate	Formiminoglutamate		

Low Significance High Significance

Metabolic Syndrome (Syndrome X)

Magnesium ↓	Palmitic (16:0)	Stearic (18:0) ↑	α-Hydroxybutyrate
β-Hydroxybutyrate ↑	β-Hydroxyisovalerate		

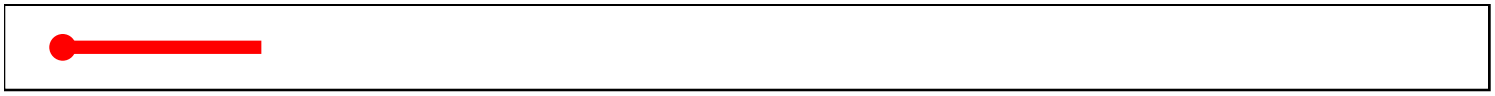
Low Significance High Significance

*8-OHdG = 8-Hydroxy-2-deoxyguanosine

3102 ION® Profile with Amino Acids 40 - Blood/Urine

Mental/Emotional

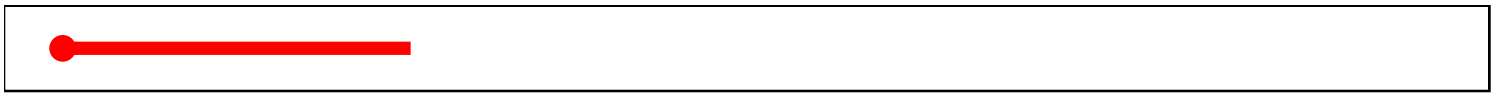
Tryptophan ↓	Tyrosine	Magnesium ↓	Eicosapentanoic
Docosahexaenoic	Xanthurenate	Methylmalonate	Formiminoglutamate
Vanilmandelate	5-Hydroxyindoleacetate ↑		



Low Significance High Significance

Intestinal/Bacterial Metabolites

Phenylacetate ↑	Phenylpropionate	p-Hydroxybenzoate	p-Hydroxyphenylacetate
Indican ↑	Tricarballylate	D-Lactate	3,4-DHPP*



Low Significance High Significance

Intestinal Yeasts/FungalMetabolites

D-Arabinitol ↑

Low Significance High Significance

Digestion/Absorption

Arginine	Histidine ↓	Isoleucine ↓	Leucine ↓
Lysine	Methionine ↓	Phenylalanine ↓	Threonine
Tryptophan ↓	Valine ↓	Selenium	

Low Significance High Significance

*3,4-DHPP = 3,4-Dihydroxyphenylpropionate

3102 ION® Profile with Amino Acids 40 - Blood/Urine

Toxic Exposure

Aluminum	Arsenic ↑	Cadmium	Lead
Mercury	Palmitelaidic (16:1n7t) ↑	Total C:18 Trans	Citrate
Cis-Aconitate	Isocitrate	Quinolinate	2-Methylhippurate ↑
Orotate	Glucarate ↑		

Low Significance High Significance

Detoxification Impairment

Methionine ↓	Glycine	Serine	Taurine
Glutamine	Pyroglutamate ↑	Sulfate	Benzoate

Low Significance High Significance

Oxidative Stress/Antioxidant Insufficiency

Taurine	Selenium	Lead	Mercury
alpha-Tocopherol	gamma-Tocopherol	Vitamin A (Retinol)	β-Carotene
Lipid Peroxides	8-OHdG*	p-Hydroxyphenyllactate ↑	Sulfate

Low Significance High Significance

Mitochondrial Functional Impairment

Magnesium ↓	Coenzyme Q10	Adipate ↑	Suberate
Ethylmalonate ↑	Pyruvate	L-Lactate ↑	α-Hydroxybutyrate
β-Hydroxybutyrate ↑	Succinate ↑	Fumarate	Malate

Low Significance High Significance

*8-OHdG = 8-Hydroxy-2-deoxyguanosine

3102 ION® Profile with Amino Acids 40 - Blood/Urine

Amino Acid Insufficiency

Arginine	Histidine ↓	Isoleucine ↓	Leucine ↓
Lysine	Methionine ↓	Phenylalanine ↓	Threonine
Tryptophan ↓	Valine ↓	Sulfate	

Low Significance High Significance

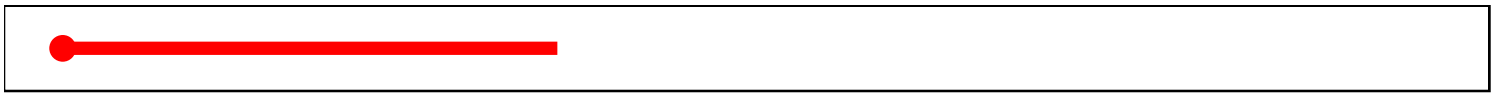
Essential Fatty Acid Insufficiency

Arachidonic	Alpha Linoleic	Eicosapentaenoic	Docosahexaenoic
Linoleic	Gamma Linolenic ↓	Dihomogamma Linolenic	Palmitoleic
Triene/Tetraene			

Low Significance High Significance

Disordered Methyl Group (Single Carbon) Transfer

Homocysteine ↑	Pentadecanoic	Heptadecanoic	Nonadecanoic ↑
Tricosanoic ↑	Xanthurenate	Methylmalonate	Formiminoglutamate
Kynurenate ↑			



Low Significance High Significance

Disordered Tryptophan Metabolism

Tryptophan ↓	Xanthurenate	5-Hydroxyindoleacetate ↑	Kynurenate ↑
Quinolinate	Indican ↑		

Low Significance High Significance

3102 ION® Profile with Amino Acids 40 - Blood/Urine

Additional Considerations

This page is provided as a starting point that may guide decisions about medical treatment based on the test results. It is derived only from the laboratory results included in this report. Final recommendations should be based on consideration of the patient's medical history and current clinical condition.

Nutrient	Nutrient Need	Clinician Recommendations
Vitamin C	Low: 250-500 mg	
Vitamin B-1 (Thiamin)	Optional: 0-10 mg	
Vitamin B-2 (Riboflavin)	Low: 10-25 mg	
Vitamin B-3 (Niacin)	Optional: 0-10 mg	
Vitamin B-5 (Pantothenic Acid)	Optional: 0-10 mg	
Vitamin B-6 (Pyridoxine)	Moderate: 25-50 mg	
Vitamin B-12 (Cobalamin)	Moderate: 250-500 mcg	
Folic Acid	Low: 250-500 mcg	
Magnesium	Moderate: 200-300 mg	
Zinc	Optional: 0-10 mg	
Black Current Oil/Evening Primrose Oil	Optional	
Carnitine	Low: 100-250 mg	
Coenzyme Q10	Moderate: 60-100 mg	
Lipoic Acid	Optional: 0-100 mg	
N-Acetylcysteine	Optional: 0-200 mg	
Need for other antioxidants	Optional	
L-Isoleucine	Moderate: 500-750 mg	
L-Leucine	Moderate: 1000-2000 mg	
L-Methionine	Low: 250-500 mg	
L-Phenylalanine	Low: 250-500 mg	
L-Tryptophan	Moderate: 500-1000 mg	
L-Valine	Low: 250-500 mg	

Various conditionally essential nurients and other potentially beneficial interventions appear in this section only if relevant abnormalities are present.