

*Accession Number:*  
*Order Number:*  
*Reference Number:*  
*Patient:*  
*Age:*                      *Sex:*  
*Date of Birth:*  
*Date Collected:*  
*Date Received:*  
*Report Date:*  
*Telephone:*  
*Fax:*  
*Reprinted:*  
*Comment:*

**0490 ION<sup>®</sup> with Amino Acids 40 Profile**

Ordering Physician:

Date Received:

Date Reported:

### Amino Acids 40 Profile - Plasma

Methodology: High Performance Liquid Chromatography

Ranges: Ages 12 and under.

#### Essential Amino Acids

##### Limiting Amino Acids

	Results µmol/L		Quintile Ranking					95% Reference Interval
			1st	2nd	3rd	4th	5th	
1 Lysine	260	H	116				230	94 - 277
2 Methionine	27		15				34	12 - 47
3 Tryptophan	56		38				66	30 - 75

##### Branched Chain Amino Acids

4 Isoleucine	75	H	35				70	29 - 111
5 Leucine	161	H	76				148	59 - 197
6 Valine	308	H	147				300	128 - 373

##### Other Essential Amino Acids

7 Phenylalanine	63		43				76	36 - 85
8 Histidine	91		62				94	52 - 108
9 Threonine	143		71				163	57 - 208

##### Conditionally Essential Amino Acids

10 Arginine	104	H	37				103	25 - 140
11 Taurine	199	H	35				93	32 - 149
12 Glycine	263		187				387	154 - 455
13 Serine	137		86				155	73 - 177

#### Functional Categories

##### Vitamin B6 Status Markers

14 α-aminoadipic acid	0.8	H					0.5	<= 1.2
15 α-Amino-n-butyric acid (α-ANB)	43	H					27	<= 34
16 γ-aminobutyric acid (GABA)	<0.6						0.6	<= 2.0
17 Cystathionine	<0.2						0.3	<= 0.3

**Amino Acids 40 Profile - Plasma**

Methodology: High Performance Liquid Chromatography

Ranges: Ages 12 and under.

**Vascular Function**

	Results µmol/L	Quintile Ranking	95% Reference Interval
		1st   2nd   3rd   4th   5th	
18 Arginine	104 <b>H</b>	37  -----  103	25 - 140
19 Taurine	199 <b>H</b>	35  -----  93	32 - 149
20 α-aminoadipic acid	0.8 <b>H</b>	-----  0.5	<= 1.2

**Neurotransmitters and Precursors**

21 Phenylalanine	63	43  -----  76	36 - 85
22 Tyrosine	67	43  -----  88	37 - 106
23 Tryptophan	56	38  -----  66	30 - 75
24 Glutamic Acid	254 <b>H</b>	31  -----  120	27 - 156
25 Taurine	199 <b>H</b>	35  -----  93	32 - 149

**Sulfur Amino Acids (Glutathione - related)**

26 Methionine	27	15  -----  34	12 - 47
27 Cystathionine	<0.2	-----  0.3	<= 0.3
28 Homocystine	<0.6	-----  0.6	<= 0.6
29 Cystine	8.8 <b>H</b>	0.9  -----  6.5	0.4 - 14.0
30 Taurine	199 <b>H</b>	35  -----  93	32 - 149

**Urea Cycle and Ammonia Detoxification**

31 Arginine	104 <b>H</b>	37  -----  103	25 - 140
32 Citrulline	27	21  -----  39	16 - 45
33 Ornithine	71	31  -----  82	24 - 97
34 Glutamine	415 <b>L</b>	468  -----  759	358 - 842
35 Asparagine	55	36  -----  69	30 - 88
36 Aspartic Acid	16.1 <b>H</b>	3.4  -----  8.6	2.7 - 11.4

Ordering  
Physician:

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Date Reported:

**Amino Acids 40 Profile - Plasma**

Methodology: High Performance Liquid Chromatography

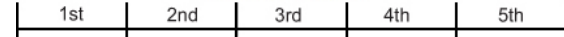
Ranges: Ages 12 and under.

**Glycine, Serine and Related Amino Acids**

Results

µmol/L

Quintile Ranking



**95%  
Reference  
Interval**

37 Alanine	476		226	530	189 - 623
38 Glycine	263		187	387	154 - 455
39 Sarcosine	5.7			13.9	<= 22.7
40 Serine	137		86	155	73 - 177
41 Phosphoserine	<0.5			0.5	<= 0.5
42 Ethanolamine	9.0	H		8.9	<= 11.2
43 Phosphoethanolamine	14.1	H		5.1	<= 7.1

**Collagen - Related Amino Acids**

44 Proline	189		104	250	88 - 346
45 Hydroxyproline	14			28	<= 36
46 Lysine	260	H	116	230	94 - 277
47 Hydroxylysine	<0.6			0.6	<= 0.6

**β-Amino Acids and Derivatives**

48 β-Alanine	7.3	H		2.4	<= 4.5
49 Histidine	91		62	94	52 - 108
50 Carnosine	0.9			5.2	<= 6.4
51 1-Methylhistidine	6.4	H		5.2	<= 8.6
52 Anserine	30			30	<= 41

**DNA (Thymine) Degradation**

53 β- Aminoisobutyric Acid	<0.3			1.4	<= 3.4
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**Muscle-Specific Amino Acids**

54 3-Methylhistidine	38	H		32	<= 43
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**Ratios**

55 Phenylalanine/Tyrosine	0.94				<= 1.28
56 Glutamic Acid/Glutamine	0.61	H	0.05	0.21	0.04 - 0.34
57 Hydroxyproline/Proline	0.074				<= 0.258
58 α-ANB/Leucine	0.27				<= 0.31
59 Tryptophan/LNAA*	0.083	L	0.098	0.106	0.096 - 0.110

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

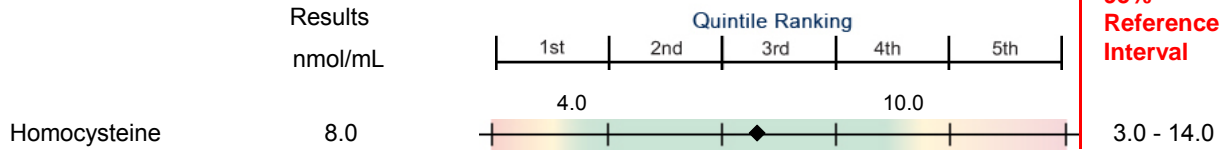
Ordering Physician:

Date Received:

Date Reported:

### Homocysteine Assay - Plasma

Methodology: Competitive Immunoassay



**Nutrient & Toxic Elements Profile - Blood**

Methodology: Inductively Coupled Plasma /Mass Spectroscopy



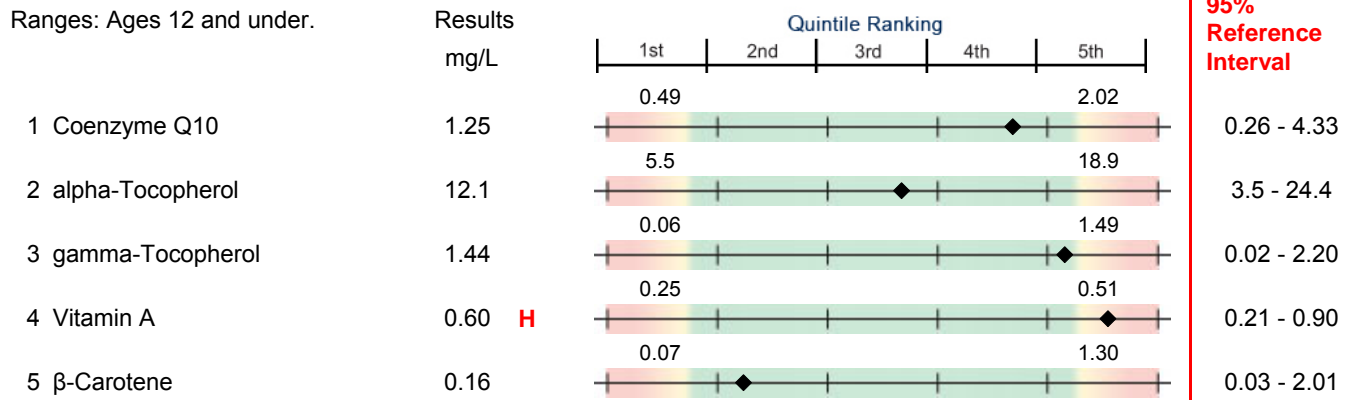
\*Relevant to membrane permeability, not nutritional status.

Toxic metals are flagged high when the result is above the 95% Reference Interval. Results for whole blood toxic elements that are within normal limits do not rule out metal accumulation in other tissues. This can be evaluated with urinary porphyrin or urine elements tests.

### CoEnzyme Q10 Plus Vitamins Profile - Serum

Methodology: High Performance Liquid Chromatography

Ranges: Ages 12 and under.



### Lipid Peroxide Assay - Serum

Methodology: High Performance Liquid Chromatography



### DNA/Oxidative Stress Marker Assay - Urine

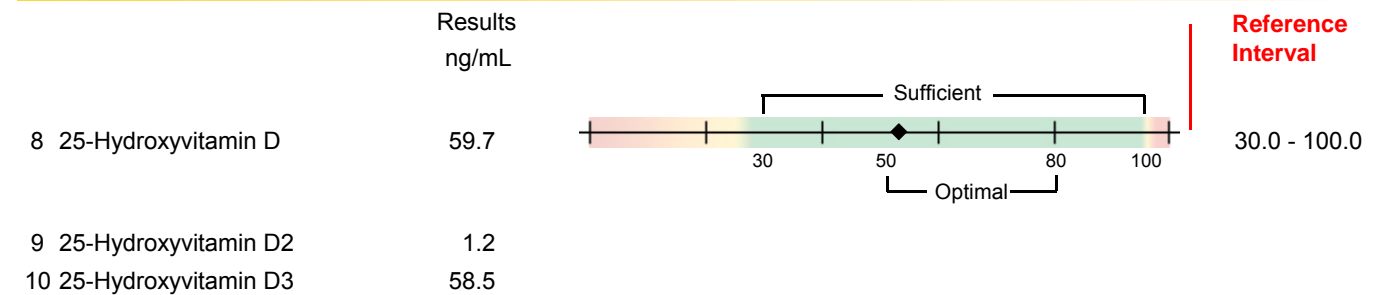
Methodology: LC/Tandem Mass Spectroscopy, Colorimetric

Ranges: Ages 12 and under.



### Vitamin D Profile - Serum

Methodology: LC/Tandem Mass Spectroscopy



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). A 2011 Endocrine Society Clinical Practice Guideline suggested vitamin D deficiency be defined as < 20 ng/ml, insufficiency as 21-29 ng/ml, and sufficiency as 30-100 ng/ml.<sup>1</sup> The Vitamin D Council has proposed 50-80 ng/ml as optimal, and 100 ng/ml as an upper limit.<sup>2</sup> 25-Hydroxyvitamin D3 is from sun exposure, vitamin D-rich foods, or vitamin D3 supplements. 25-Hydroxyvitamin D2 is only from fortified foods or supplements.

- Holick MF, Binkley, NC, Bischoff-Ferrari, HA, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab.* July 2011, 96(7):1911-1930.
- Vitamin D Council <http://www.vitamindcouncil.org>.

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

\* <DL = less than detection limit

**Fatty Acids Profile - Plasma**

Methodology: Capillary Gas Chromatography/Mass Spectrometry

Ranges: Ages 12 and under.





**Fatty Acids Profile - Plasma**

Methodology: Capillary Gas Chromatography/Mass Spectrometry

Ranges: Ages 12 and under.

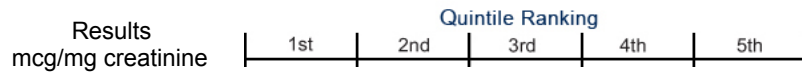


**Organix® Comprehensive Profile - Urine**

Methodology: LC/Tandem Mass Spectroscopy, Colorimetric

Ranges: Ages 12 and under.

**95%  
Reference  
Interval**



**NUTRIENT MARKERS**

**Fatty Acid Metabolism**

(Carnitine & B2)

Item	Results	Quintile Ranking	95% Reference Interval
1 Adipate	5.7	7.5	<= 12.5
2 Suberate	0.4	3.2	<= 8.9
3 Ethylmalonate	1.5	5.5	<= 9.4

**Carbohydrate Metabolism**

(B1, B3, Cr, Lipoic Acid, CoQ10)

Item	Results	Quintile Ranking	95% Reference Interval
4 Pyruvate	<DL*	4.3	<= 7.5
5 L-Lactate	1.9	15.1	1.4 - 38.5
6 β-Hydroxybutyrate	<DL*	2.2	<= 7.9

**Energy Production (Citric Acid Cycle)**

(B comp., Q10, Amino acids, Mg)

Item	Results	Quintile Ranking	95% Reference Interval
7 Citrate	207	703	59 - 1,276
8 Cis-Aconitate	50	77	27 - 119
9 Isocitrate	19 L	162	63 - 232
10 α-Ketoglutarate	<DL*	38.0	<= 82.0
11 Succinate	16.9	36.1	<= 61.0
12 Fumarate	0.65	0.69	<= 1.56
13 Malate	0.3	1.9	<= 4.6
14 Hydroxymethylglutarate	1.3	8.9	<= 13.9

**B-Complex Vitamin Markers**

(B1, B2, B3, B5, B6, Biotin)

Item	Results	Quintile Ranking	95% Reference Interval
15 α-Ketoisovalerate	0.17	0.29	<= 0.54
16 α-Ketoisocaproate	<DL*	0.42	<= 0.63
17 α-Keto-β-Methylvalerate	<DL*	0.42	<= 1.12
18 Xanthurenate	0.60 H	0.32	<= 0.46
19 β-Hydroxyisovalerate	1.7	13.5	<= 22.5

**Methylation Cofactor Markers**

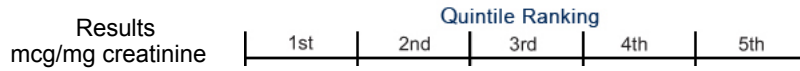
(B12, Folate)

Item	Results	Quintile Ranking	95% Reference Interval
20 Methylmalonate	0.7	2.4	<= 3.3
21 Formiminoglutamate	<DL*	1.9	<= 3.2

**Organix® Comprehensive Profile - Urine**

Methodology: LC/Tandem Mass Spectroscopy, Colorimetric

Ranges: Ages 12 and under.



95%  
Reference  
Interval

**CELL REGULATION MARKERS**

**Neurotransmitter Metabolism Markers**

(Tyrosine, Tryptophan, B6, antioxidants)

Item	Results	Quintile Ranking	95% Reference Interval
22 Vanilmandelate	2.6 L	2.9 - 6.4	2.0 - 8.2
23 Homovanillate	2.4 L	3.3 - 11.3	2.4 - 16.7
24 5-Hydroxyindoleacetate	2.0 L	3.7 - 11.9	2.6 - 22.2
25 Kynurenate	0.3	1.4	<= 2.3
26 Quinolinate	1.0	8.0	<= 12.3
27 Picolinate	1.9 L	16.3	4.8 - 28.7

**Oxidative Damage and Antioxidant Markers**

(Vitamin C and other antioxidants)

28 p-Hydroxyphenyllactate	0.16	0.27	<= 0.67
29 8-Hydroxy-2-deoxyguanosine	2.8	5.9	<= 8.7

(Units for 8-Hydroxy-2-deoxyguanosine are ng/mg creatinine).

**TOXICANTS AND DETOXIFICATION**

**Detoxification Indicators**

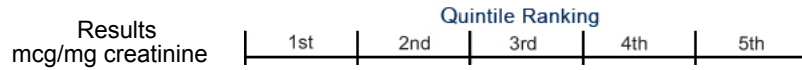
(Arg, NAC, Met, Mg and antioxidants)

30 2-Methylhippurate	0.084	0.122	<= 0.283
31 Orotate	<DL*	1.05	<= 1.59
32 Glucarate	2.9	9.1	<= 14.8
33 a-Hydroxybutyrate	0.2	0.3	<= 0.8
34 Pyroglutamate	34	101	34 - 154
35 Sulfate	1,741	1,073 - 3,191	784 - 4,494

**Organix® Comprehensive Profile - Urine**

Methodology: LC/Tandem Mass Spectroscopy, Colorimetric

Ranges: Ages 12 and under.



**95%  
Reference  
Interval**

**COMPOUNDS OF BACTERIAL OR YEAST/FUNGAL**

**Bacterial - general**

Item	Results	Quintile Ranking	Reference Interval
36 Benzoate	<DL*	2.1	<= 33.6
37 Hippurate	54	667	<= 1,271
38 Phenylacetate	<DL*	0.14	<= 0.80
39 Phenylpropionate	<DL*		<= 0.06
40 p-Hydroxybenzoate	<DL*	2.2	<= 4.0
41 p-Hydroxyphenylacetate	4	24	<= 48
42 Indican	14	64	<= 99
43 Tricarballoylate	0.36	1.18	<= 2.00

**L. acidophilus / general bacterial**

44 D-Lactate	0.6	2.6	<= 5.6
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**Clostridial species**

45 3,4-Dihydroxyphenylpropionate	<DL*		<= 0.12
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**Yeast / Fungal**

46 D-Arabinitol	10	53	<= 92
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Creatinine = 199 mg/dL

\* <DL = less than detection limit

\*\* >LIN = greater than linearity limit

## ION Analyte Pattern Analysis

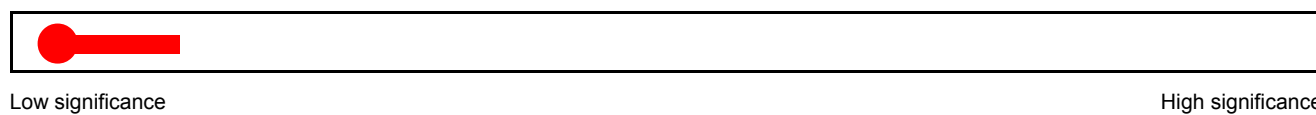
A multi-analyte report can provide greater insight about health risks and special nutrient needs. Patterns of abnormalities can reinforce the degree of significance indicated by a single measurement. Analytes from the various profiles in the ION report are combined below into categories associated with 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 H or L appears when the patient result is in the fifth quintile (80%) of the population. An additional **X** next to an analyte indicates that the patient result is outside the 95% reference interval for that analyte.

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 preceding laboratory reports provide the detail upon which these thermometers are based.

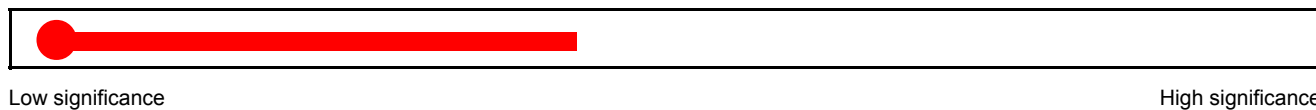
### Cardiovascular System

Arginine	Homocysteine	Calcium	Magnesium <span style="float: right;">L</span>
CoQ10	a-Tocopherol	g-Tocopherol	Lipid Peroxides
8-OHDG	AA/EPA		



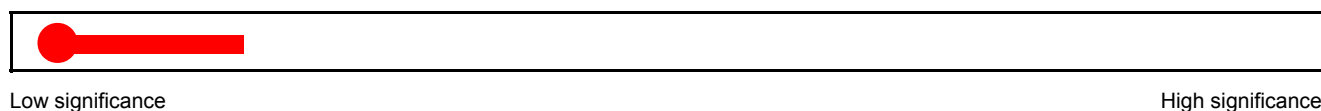
### Fatigue

Isoleucine <span style="float: right;">H</span>	Leucine <span style="float: right;">H</span>	Phenylalanine	Valine <span style="float: right;">H</span>
Magnesium <span style="float: right;">L</span>	CoQ10	Adipate	Suberate
AKG	Succinate	Malate	Xanthurenate <span style="float: right;">X H</span>
MeMalonate	FIGLU		



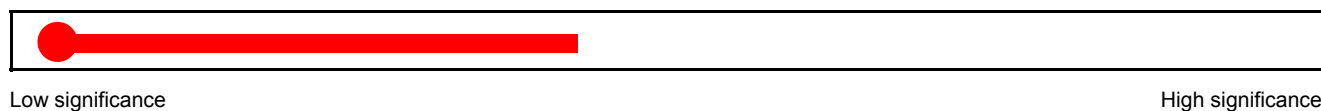
### Metabolic Syndrome (Syndrome X)

Magnesium <span style="float: right;">L</span>	Palmitic	Stearic	AHB
BHB	BHiVal		



### Mental/Emotional

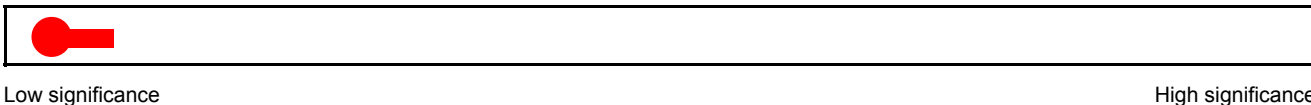
Tryptophan	Tyrosine	Magnesium <span style="float: right;">L</span>	EPA
DHA	Xanthurenate <span style="float: right;">X H</span>	MeMalonate	FIGLU
VMA <span style="float: right;">L</span>	5-HIA <span style="float: right;">X L</span>		



# ION Analyte Pattern Analysis

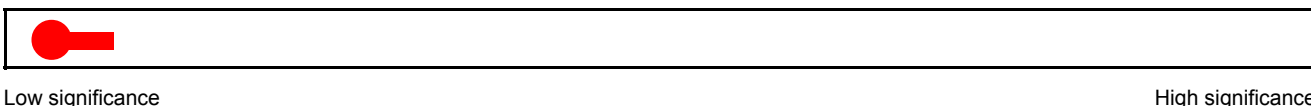
## Intestinal Bacterial Metabolites

PhAc	PhProp	pOHBenz	pOHPhAc
Indican	Tricarb	D-Lactate	3,4-DHPP



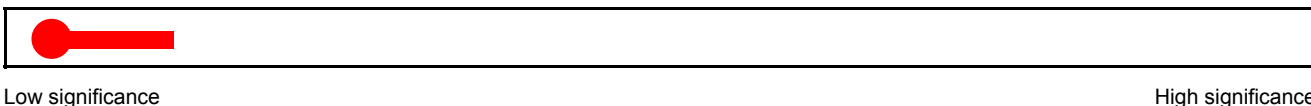
## Intestinal Yeasts / Fungal Metabolites

D-Arabinitol



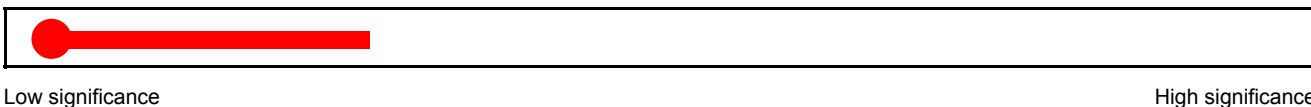
## Digestion/Absorption

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



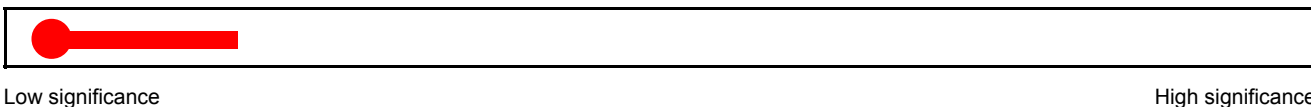
## Toxic Exposure

Aluminum	Arsenic	Cadmium	Lead
Mercury	Palmitelaidic X H	C18TrFa	Citrate
Cis-Aconitate	Isocitrate	Quinolate	2-MeHipp
Orotate	Glucarate		



## Detoxification Impairment

Methionine	Glycine	Serine	Taurine
Glutamine L	Pyroglutamate	Sulfate	Benzoate



# ION Analyte Pattern Analysis

## Oxidative Stress/Antioxidant Insufficiency

Taurine	Selenium	Lead	Mercury	H
a-Tocopherol	g-Tocopherol	Vitamin A	b-Carotene	
Lipid Peroxides	8-OHdG	pOHPHLac	Sulfate	

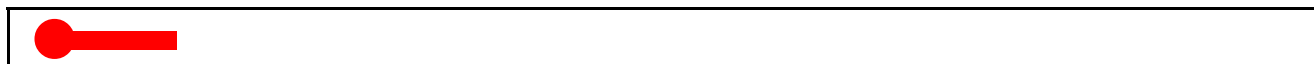


Low significance

High significance

## Mitochondrial Functional Impairment

Magnesium	L	CoQ10	Adipate	Suberate
Ethylmalonate		Pyruvate	L-Lactate	AHB
BHB		Succinate	Fumarate	Malate

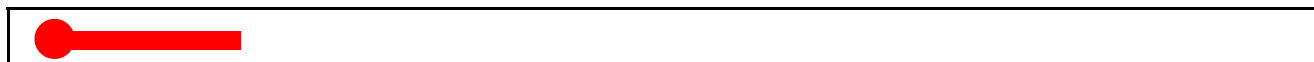


Low significance

High significance

## Amino Acid Insufficiency

Arginine	Histidine	Isoleucine	H	Leucine	H
Lysine	Methionine	Phenylalanine		Threonine	
Tryptophan	Valine	AKG		Succinate	
Sulfate					

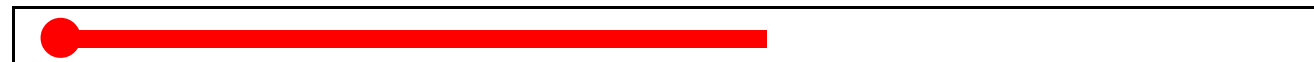


Low significance

High significance

## Essential Fatty Acid Insufficiency

AA	ALA	L	EPA	DHA
LA	GLA	L	DGLA	Palmitoleic
Triene/Tetraene				



Low significance

High significance

## Disordered Methyl Group (Single carbon) Transfer

Homocysteine	Pentadeca	Heptadeca	Nonadecanoic
Tricosanoic	Xanthurenate	MeMalonate	FIGLU
Kynurenate	X H		



Low significance

High significance

# ION Analyte Pattern Analysis

## Disordered Tryptophan Metabolism

Tryptophan	Xanthurenate <b>XH</b>	5-HIA	<b>XL</b>	Kynurenate
Quinolate	Indican			



Abbreviation	Analyte Name	Abbreviation	Analyte Name
2-MeHipp	2-Methylhippurate	FIGLU	Formiminoglutamate
5-HIA	5-Hydroxyindoleacetate	g-Tocopherol	gamma-Tocopherol
8-OhdG	8-Hydroxy-2-deoxyguanosine	GLA	Gamma Linoleic (18:3n6)
AA/EPA	Arachidonic (20:4n6)/Eicosapentaenoic (20:5n3)	Heptadeca	Heptadecanoic (17:0)
AHB	a-Hydroxybutyrate	Hcys	Homocysteine
aKbMeVal	a-Keto-β-Methylvalerate	HVA	Homovanillate
AKG	a-Ketoglutarate	HMG	Hydroxymethylglutarate
aKiCap	a-Ketoisocaproate	LA	Linoleic (18:2n6)
aKiVal	a-Ketoisovalerate	MeMalonate	Methylmalonate
ALA	Alpha Linolenic (18:3n3)	Pentadeca	Pentadecanoic (15:0)
a-Tocopherol	alpha-Tocopherol	PhAc	Phenylacetate
BHB	β-Hydroxybutyrate	PhProp	Phenylpropionate
BHiVal	β-Hydroxyisovalerate	pHBenz	p-Hydroxybenzoate
C18TrFa	Total C:18 Trans	pHPhAc	p-Hydroxyphenylacetate
CoQ10	Coenzyme Q10	pHPhLac	p-Hydroxyphenyllactate
DGLA	Dihomogamma Linolenic (20:3n6)	Total C:18	Total c:18 Trans
DHA	Docosahexanoic (22:6n3)	Tricarb	Tricarallylate
3,4-DHPP	3,4-Dihydroxyphenylpropionate	Triene/Tetraene	Mead/Arachidonic Ratio
EPA	Eicosapentaenoic (20:5n3)	VMA	Vanilmandelate