NutriPATH
INTEGRATIVE PATHOLOGY SERVICES
P: 1300 688 522
E: info@nutripath.com.au

TEST PATIENT
01-Jan-1958 Female

1 TEST CRT
BURWOOD VIC 3125

Dr.TEST DOCTOR
TEST HEALTH CENTRE
123 TEST STREET
BURWOOD VIC 3125

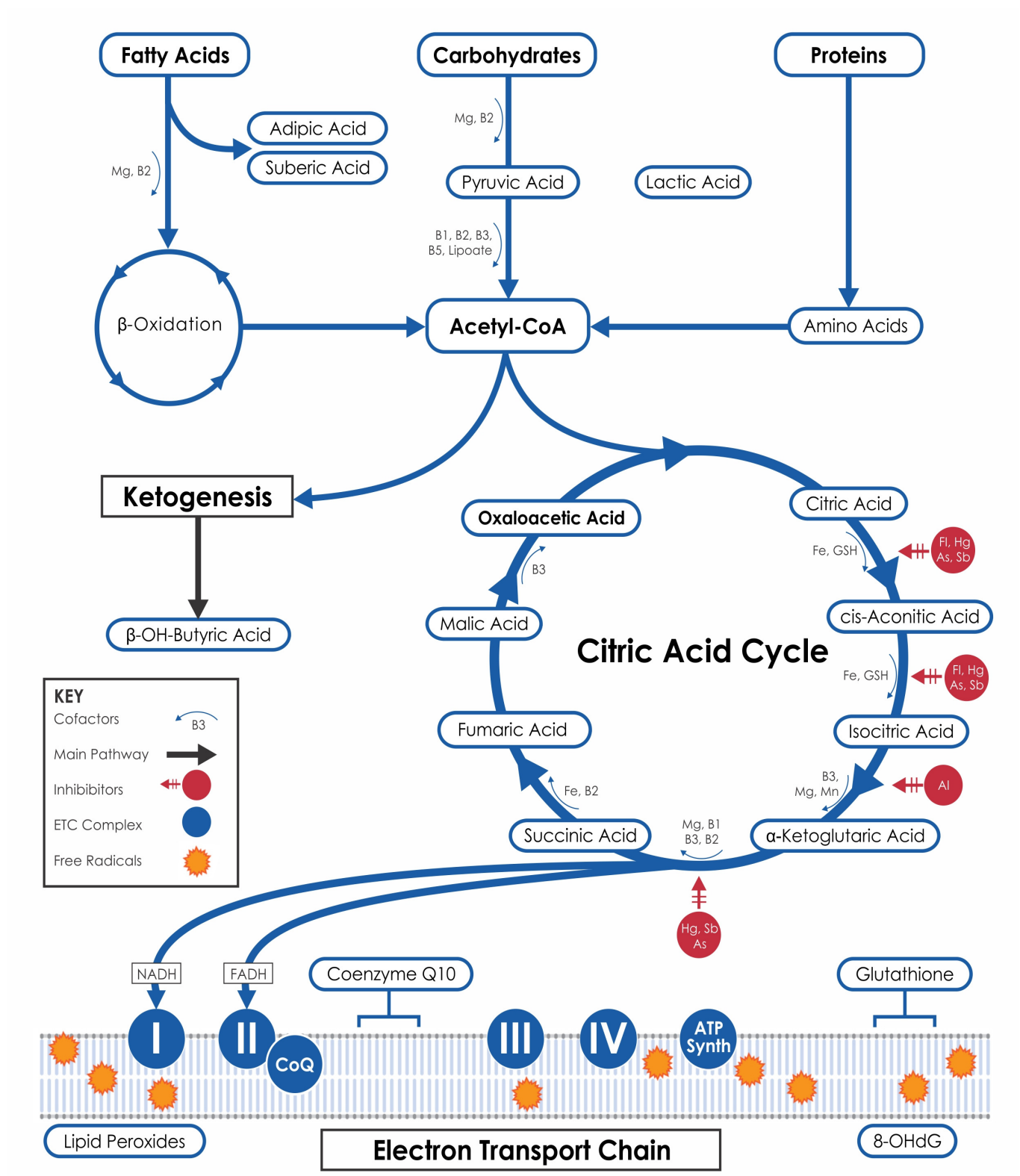
LAB ID : 3822147
UR NO. :
Collection Date : 15-Jun-2022
Received Date: 15-Jun-2022

3822147

ORGANIC ACIDS METABOLOMIC MAPPING

Method: LCMS/MS/MS

Organic Acids Pathways



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Nutrient Markers

URINE, SPOT

KETONE/FATTY ACID Metabolites
(Carnitine & B2)

1.	Adipic Acid.	3.60	0.00 - 11.10	ug/mgCR
2.	Suberic Acid.	2.10	0.00 - 4.60	ug/mgCR
3.	Ethylmalonic Acid	4.10	0.00 - 6.30	ug/mgCR
4.	Pimelic Acid	12.0	5.9 - 31.8	nmol/mg Cr
5.	Methyl-Succinic Acid	5.50	3.20 - 21.10	nmol/mg Cr

CARBOHYDRATE Metabolism/Glycolysis
(B1, B3, Cr, Lipoic Acid, CoQ10)

6.	Pyruvic Acid.	6.60 *H	0.00 - 6.40	ug/mgCR
7.	Lactic Acid.	23.50 *H	0.00 - 16.40	ug/mgCR
8.	b-OH-Butyric Acid	8.60	0.00 - 9.90	ug/mgCR
9.	Glucose (OA)	1.1	0.3 - 1.1	mmol/L

CITRIC ACID CYCLE Metabolites.
(B Comp., CoQ10, Amino Acids, Mg)

10.	Citric Acid.	450.00	56.00 - 987.0	ug/mgCR
11.	cis-Aconitic Acid.	29.00	18.00 - 78.00	ug/mgCR
12.	Isocitric Acid.	49.00	35.00 - 143.0	ug/mgCR
13.	a-Ketoglutaric Acid.	21.00	0.00 - 35.00	ug/mgCR
14.	Succinic Acid	9.50	1.10 - 20.90	ug/gCR
15.	Fumaric Acid.	1.10	1.10 - 1.35	ug/mgCR
16.	Malic Acid.	2.90	0.00 - 3.10	ug/mgCR
17.	b-OH-b-Methylglutaric Acid	1.20	0.00 - 5.10	ug/mgCR

B-Complex Vitamins & Amino Acid Markers
(B1, B2, B3, B5, B6, Biotin)

18.	a-Ketoisovaleric Acid	0.24	0.00 - 0.49	ug/mgCR
19.	a-Ketoisocaproic Acid	0.30	0.00 - 0.52	ug/mgCR
20.	a-Keto-b-Methylvaleric Acid	0.95	0.00 - 1.10	ug/mgCR
21.	Xanthurenic Acid	0.2	0.0 - 0.5	ug/mgCR
22.	beta-Hydroxyisovaleric Acid	5.50	0.00 - 11.50	ug/mgCR

METHYLATION COFACTORS
(B12, Folate)

23.	Methylmalonic Acid.	*2.90* *H	0.00 - 2.30	ug/mgCR
24.	Formiminoglutamic Acid	1.4	0.0 - 2.2	ug/mgCR

Cell Regulation Markers

NEUROTRANSMITTER METABOLISM
(Tyrosine, Tryptophan, B6, Antioxidants)

25.	Homovanillic Acid (HVA)	5.00	1.40 - 7.60	ug/mgCR
26.	Vanillylmandelic Acid (VMA)	4.60	1.20 - 5.30	mmol/molCr
27.	5-Hydroxyindoleacetic Acid (5HIAA)	9.60	1.60 - 9.80	ug/mgCR
28.	Kynurenic Acid.	1.1	0.0 - 1.5	ug/mgCR
29.	Quinolinic Acid (OA)	4.70	0.00 - 5.80	ug/mgCR
30.	Picolinic Acid	10.0	2.8 - 13.5	ug/mgCR
31.	Cortisol (OA)	*555.0* *H	166.0 - 507.0	nmol/L

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Oxidative Damage/AntiOxidant Markers
(Vitamin C and Other Antioxidants)

32.	ParaHydroxyphenyllactate	0.57		0.00 - 0.66	ug/mgCR
33.	8 OH-deoxyguanosine	3.8		0.0 - 7.6	ug/mgCR

Toxicants and Detoxification

DETOXIFICATION INDICATORS
(Arg, NAC, Met, Mg, Antioxidants)

34.	2-Methylhippuric Acid	<dl		0.00 - 0.19	ug/mgCR
35.	Orotic Acid.	0.96		0.00 - 1.01	ug/mgCR
36.	Glucaric Acid.	5.6		0.0 - 10.7	ug/mgCR
37.	a-OH-Butyric Acid	0.77		0.00 - 0.90	ug/mgCR
38.	Pyroglutamic Acid.	33.00		28.00 - 88.00	ug/mgCR

Compounds of Bacterial or Yeast/Fungal Origin

BACTERIAL DYSBIOSIS MARKERS.

39.	Benzoate (OA)	*18.00*	*H	0.00 - 9.30	ug/mgCR
40.	Hippurate (OA)	944		0.0 - 1070	ug/mgCR
41.	Phenylacetate	*5.6*	*H	0.0 - 0.2	ug/mgCR
42.	Phenylpropionate	*2.3*	*H	0.0 - 0.1	ug/mgCR
43.	ParaHydroxyBenzoate	*3.5*	*H	0.0 - 1.8	ug/mgCR
44.	p-HydroxyPhenylacetate	24.0		0.0 - 34.0	ug/mgCR
45.	Indoleacetic Acid	57.00		0.00 - 90.00	ug/mgCR
46.	Tricarballylate	0.95		0.00 - 1.41	ug/mgCR

L. acidophilus/General Bacteria

47.	D-Lactate	0.9		0.0 - 4.1	ug/mgCR

CLOSTRIDIAL SPECIES

48.	Dihydroxyphenylpropionic Acid	*0.1*	*H	0.0 - 0.1	ug/mgCR
49.	4-Cresol	11.0		0.0 - 75.0	mmol/molCr
50.	3-OH-Proprionic Acid	2.0		0.0 - 208.0	mmol/molCr

YEAST/FUNGAL DYSBIOSIS MARKERS.

51.	Arabinitol	5.0		0.0 - 73.0	ug/mgCR
52.	Citramalic Acid	3.1		0.0 - 3.6	mmol/molCr
53.	Tartaric Acid.	4.0		0.0 - 7.0	ug/mgCR

Oxalate Metabolites

54.	Oxalic Acid	5.60		0.77 - 7.00	ug/mgCR
55.	Glyceric Acid	21.0		16.0 - 117.0	mmol/molCr
56.	Glycolic Acid	14.0		6.8 - 101.0	mmol/molCr

Nutritional Markers

57.	Pyridoxic Acid (Vit B6)	5.0		0.0 - 34.0	mmol/molCr
58.	Pantothenic Acid (Vit B5)	6.0		0.0 - 10.0	mmol/molCr
59.	Glutaric Acid (Vit B2)	0.2		0.0 - 0.4	mmol/molCr
60.	Ascorbic Acid (Vit C)	*9.0*	*L	10.0 - 200	mmol/molCr
61.	CoEnzyme-Q10 (CoQ10)	15.00		0.17 - 39.00	mmol/molCr
62.	N-Acetylcysteine (NAC)	0.14		0.00 - 0.28	mmol/molCr

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Nutritional Guide

Nutrient	Adult Dose Range	Units	Clinician Notes
Vitamin-C	450.0	mg	
Vitamin-B1	15.0	mg	
Vitamin-B2	17.0	mg	
Vitamin-B3	13.0	mg	
Vitamin-B5	10.0	mg	
Vitamin-B6	5.0	mg	
Vitamin-B12	450.0	ug	
Chromium .	3.0	ug	
Magnesium .	140.0	mg	
Acetyl-L-Carnitine.	20.0	mg	
N-Acetylcysteine.	5.0	mg	
Glutathione.	4.6	mg	
Glycine .	5.0	mg	
Methionine.	6.0	mg	
Ornithine.	10.0	mg	
Serine.	5.0	mg	
Taurine .	6.0	mg	
Tryptophan.	8.0	mg	
Lactobacillus	1.0	billion CFU	
Probiotics (Multistain)	1.0	billion CFU	
D-Lactate-free probiotics	1.0	billion CFU	

Disclaimer:

Supplement recommendations are based on the Organic Acid test results. The prescribing health practitioner must take into consideration the age, weight, sex, and pregnancy or lactation state. In addition, consider clinical state, medication regime, associated drug-nutrient depletion and allergies. The doses listed above are considered optimal, based on lab results and do not apply to specific disease conditions where doses may need to be altered. The vitamins, minerals or amino acids listed are elemental quantities. Use clinical discretion when choosing the right salt with the guidance of your compounding health professional. For example, Magnesium may be prescribed as a glycinate for its calming effect or threonate may be used for a Magnesium that crosses the blood-brain-barrier.

References:
Laboratory Evaluations for Integrative and Functional Medicine by Richard Lord.
J.Alexander Bralley; Textbook of Nutritional Medicine by Alan Gaby.

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Laboratory Comments

Organic acids provide functional markers for the metabolic effects of micronutrient adequacy, toxic exposure, neuroendocrine activity, intestinal bacterial and fungal overgrowth. Organic acid testing indicates the need for nutrients, diet modification, detoxification, antioxidant protection or further testing.

In a healthy state, organic acids are excreted in the urine at low concentrations. Low range results may be associated with hypometabolic compensatory states. Compensatory responses include hormonal secretions and cytokine responses that can slow or reverse deviations from median or normal physiologic states.

The Krebs cycle is a process of conversion of fats, carbohydrates and protein to mitochondrial energy, ATP.

Metabolic blocks in the Krebs cycle due to insufficient enzymes or cofactors will result in the elevation of organic acids that accumulate and spill into urine.

Carbohydrate Metabolism and Glycolisis

Dietary carbohydrates are broken down into Glucose and other sugars where carbohydrate breakdown products, pyruvate and lactate are formed. Pyruvate enters the Krebs cycle via dehydrogenase enzymes which require vitamin B1 (thiamine), Vit B2 (riboflavin), vitamin B3 (niacin), vitamin B5 (pantothenic acid), and lipoic Acid to function correctly. Review Vitamin B Levels in conjunction with Pyruvate and Lactate levels.

In the absence of these nutrients, lactate builds up leading to lactic acidosis. Elevated pyruvate and lactate can indicate a need for lipoic acid.

Pyruvate

Elevated pyruvate is associated with increased exercise, bacterial, shock, inborn error of metabolism and anaemia.

Consider Vitamin B1 (thiamine), Vitamin B2 (riboflavin), Vitamin B3 (niacin), Vitamin B5 (pantothenic acid), and lipoic Acid.

Methylmalonate (MMA)

Methylmalonyl-Co-A (MMA) is produced from breakdown of isoleucine, Valine, methionine and threonine. MMA is converted into succinic acid via a B12 dependent enzyme Methylmalonyl-Co-A mutase. Elevations in MMA is associated with vitamin B12 deficiency, pernicious anaemia, GI bacterial metabolism, malabsorption or gastroenteritis.

Consider: Vitamin B12.

Bacterial- Dysbiosis

Benzoate and hippurate are metabolically related as substrates and products of the glycine conjugation system. Urinary benzoate and hippurate are functional markers of a common genetic weakness in glycine conjugation.

Benzoate

Benzoate was one of the compounds first found to be elevated in urine from patients with intestinal bacterial overgrowth and a metabolic product of free intestinal phenylalanine. Benzoates are found in jams and foods containing paraben preservatives.

Hippurate

Hippurate is the most abundant marker of dysbiosis because its precursor, benzoate is the principal product of intestinal bacterial metabolism of dietary polyphenols.

Consider a Microbiome assessment to determine microbial overgrowth.

Phenylacetate, Phenylpropionate, p-Hydroxybenzoate, p-Hydroxyphenylacetate

One or more of the phenyl compounds may be elevated due to overgrowth of intestinal bacteria involved in their production from dietary polyphenols or undigested phenylalanine.