WellLab

TEST PATIENT
Sample TestName
Sex : F
Date Collected : 00-00-0000

LAB ID: 00000000 UR#:0000000

TEST PHYSICIAN
DR EDWARD CHAN
11-1, WISMA LAXTON,
JALAN DESA, TAMAN
DESA, 58100 KL

INTEGRATIVE MEDICINE

URINE, SPOT | Result | Range | Units

Organic Acids Introduction

Organic acids are metabolic intermediates that are produced in pathways of central energy production, detoxification and biotransformation, neurotransmitter breakdown, or intestinal microbial activity. Marked accumulation of specific organic acids detected in urine often signals a metabolic inhibition or blockage. The abnormality may be due to a nutrient deficiency, an inherited enzyme deficiency, toxic interference or drug effect.

Several analytes provide insight into gastrointestinal bacterial or fungal imbalance.
Elevations in any organic acids can contribute to metabolic acidosis
Symptoms from mild, chronic acidurias may not manifest until adulthood
The mitochondrial function markers include:
Fatty Acid Metabolism
Carbohydrate Metabolism
Citric Acid Cycle Intermediates

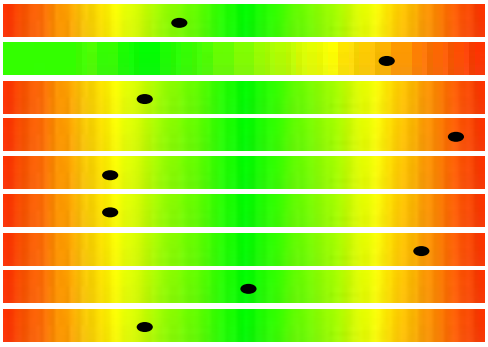
CITRIC ACID CYCLE Metabolites.

Citric Acid Cycle Metabolism

Citric Acid Cycle Metabolites serve both anabolic and catabolic functions. They are the final common pathway of energy release from catabolism of fats, proteins, and carbohydrates.
They are the source of basic structural moleules that are drawn away from the cycle to support organ maintenance and neurological function-anabolic processes
Crossroads of food conversion and utilization.
Spillage of Citric Acid Cycle intermediates into the urine may indicate mitochondrial inefficiencies in energy production. A block in any step may cause a build up of compounds that precede this step.
Amino acids supply carbon skeletons for maintaining mitochondrial concentrations.

Citrate, cis-Aconitate and Isocitrate ar the key organic acids in this biochemical pathway and are responsible for aerobic energy production

Pyruvic Acid.	1.80	0.60 - 6.61	ug/mgCR	
Lactic Acid.	*1.59* *H	0.00 - 1.58	ug/mgCR	
Citric Acid.	105.10	37.50 - 417.80	ug/mgCR	
cis-Aconitic Acid.	*50.60* *H	12.00 - 42.90	ug/mgCR	
Isocitric Acid.	*5.80* *L	7.80 - 45.90	ug/mgCR	
a-Ketoglutaric Acid.	17.39	10.40 - 168.30	ug/mgCR	
Succinic Acid	*15.29* *H	1.80 - 13.30	ug/gCR	
Fumaric Acid.	0.68	0.18 - 1.20	ug/mgCR	
Malic Acid.	0.40	0.30 - 1.45	ug/mgCR	



KETONE/FATTY ACID Metabolites

(*) Result outside normal reference range (H) Result is above upper limit of reference rang (L) Result is below lower limit of reference range

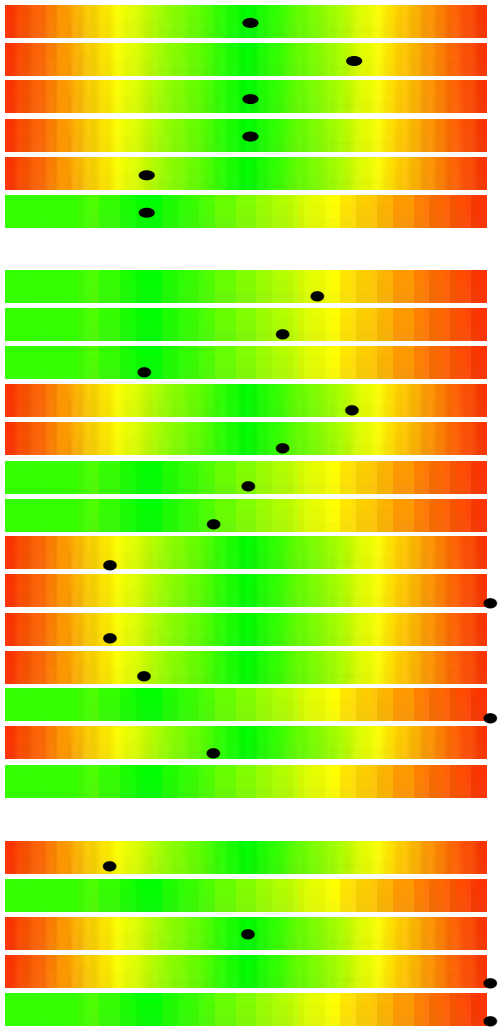
Ketone/Fatty Acid Metabolism

Fatty Acid Metabolism is needed for energy production.

Key Supplements:
Carnitine a metabolic cofactor synthesized from L-Lysine and L-methionine (as SAMe)
Conditionally essential nutrient
Fatty acid transport carrier from cytosol into mitochondria for beta -oxidation
Vitamin B2 (riboflavin)
Aids oxidative metabolism of fats within the mitochondria

Key Organic Acids:
Adipate (Adipic Acid) and Suberate (Suberic Acid)
Functional markers of carnitine insufficiency
Six and eight carbon dicarboxylic acids, respectively
Products of peroxisomal fatty acid oxidation
Indreased when carnitine insufficiency limits long chain fatty acid entry into mitochondria

Adipic Acid.	1.73	0.46 - 3.01	ug/mgCR
Suberic Acid.	2.01	0.34 - 2.34	ug/mgCR
Ethylmalonic Acid	2.51	1.09 - 4.22	ug/mgCR
Methyl-Succinic Acid	1.50	0.62 - 2.19	ug/mgCR
a-OH-Butyrate	0.40	0.16 - 2.76	ug/mgCR
b-OH-Butyrate	0.14	0.00 - 1.90	ug/mgCR
ORG. Acids for COFACTOR NEED.			
a-Ketoisovaleric Acid	0.16	0.00 - 0.22	ug/mgCR
a-Ketoisocaproic Acid	0.39	0.00 - 0.57	ug/mgCR
a-Keto-b-Methylvaleric Acid	0.11	0.00 - 0.69	ug/mgCR
beta-Hydroxyisovalerate	5.89	0.15 - 7.03	ug/mgCR
Methylmalonic Acid.	1.27	0.44 - 1.90	ug/mgCR
Formiminoglutamic Acid	4.8	0.0 - 9.0	ug/mgCR
Kynurenic Acid.	2.01	0.00 - 6.27	ug/mgCR
b-OH-b-Methylglutaric Acid	*1.12* *L	1.34 - 6.55	ug/mgCR
ParaHydroxyphenyllactate	*2.45* *H	0.31 - 1.21	ug/mgCR
Orotic Acid.	0.15	0.14 - 0.64	ug/mgCR
Pyroglutamic Acid.	8.42	6.66 - 23.87	ug/mgCR
Benzoate (OA)	*0.54* *H	0.00 - 0.41	ug/mgCR
Hippurate (OA)	254	12.9 - 663	ug/mgCR
Benzoic/Hippuric Acids Ratio	0.0	0.0 - 0.0	RATIO
BACTERIAL DYSBIOSIS MARKERS.			
ParaHydroxyBenzoate	0.5	0.5 - 2.7	ug/mgCR
Phenylacetic Acid.	0.0	0.0 - 0.0	ug/mgCR
2-OH-Phenylacetic Acid	0.68	0.35 - 1.04	ug/gCR
Indoleacetic Acid	*7.65* *H	0.18 - 3.98	ug/mgCR
Tricarballylate	*1.43* *H	0.00 - 0.79	ug/mgCR



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YEAST/FUNGAL DYSBIOSIS MARKERS.				
Citramalic Acid	**6.6**	0.0 - 7.0	ug/mgCR	
Arabinose.	**31.4**	0.0 - 42.3	ug/mgCR	
b-Ketoglutaric Acid.	**0.0**	0.0 - 0.0	ug/mgCR	
Tartaric Acid.	**8.2**	0.0 - 14.1	mmol/molCr	
NEUROTRANSMITTER METABS.				
HVA	***3.7* *H**	2.5 - 3.5	mmol/molC	
VMA	**2.8**	2.5 - 3.5	mmol/molC	
5HIAA	**3.2**	3.0 - 4.5	mmol/molC	
Quinolinate (OA)	**3.20**	0.00 - 6.10	ug/mgCR	

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Bacterial Dysbiosis Comment

PHENYLACETATE (PAA) COMMENT
- Intestinal bacterial action on polyphenols, tyrosine or phenylalanine results in PAA production
- Should only be present in background concentrations in healthy subjects
- Is trace product of endogenous phenylalanine, may accumulate in phenylketonuria (PKU)
- May accululate in schizophrenia
- Elimination may be redcud in depression
- May modulate estrogen-mediated cancers

IF PHENYLACETATE HIGH:
Causes: Intestinal bacterial overgrowth, Polypherol intake in the presence of PAA-producing bacteria, Malabsorption of phenylalanine due to low HCI in stomach, PKU

Symptoms/Conditions
Rule out PKU

TREATMENT:
Decrease sugars and amino acids

Indican (Indoleacetate) is a by-product from breakdown of dietary protein in the upper bowel. Bacteria are responsible for the production of indican. Indican is present only at low levels in a healthy person. An elevated level of urinary indican is an indication of upper bowel bacterial overgrowth or dysbiosis. Indican excretion is reduced when the intestines are populated with strains of lactobacillus.
Succinate Elevated:
This is a citric acid cycle (CAC) intermediate in the body's metabolic pathway that generates cellular energy. The Krebs or CAC is the source of basic structural or anabolic molecules that feed and support organ maintenance and neurological cofactors and minerals maintenance and neurological cofactors and minerals for their function. Higher levels of CAC intermediates in urine indicate inefficiencies in energy production in the cells.
High values may also be due to bacterial conversion of glutamine to succinic acid in the gastrointestinal tract.
This result is suggestive of mitochondrial dysfunction, poor functioning of the citric acid cycle, gentamicin toxicity or, if citrate, cis-aconitate and orotate are elevated, an ammonia clearance disorder and possibly arginine deficiency.
Drugs which may have an adverse affect: Methotrexate.

SUPPLEMENTATION RECOMMENDATIONS:
B-complex (B2), CoQ10, Iron, manganese, and magnesium.

TRICARBALLYLATE COMMENT:
- Tricarhballylate has extremely high affinity for magnesium, preengting its absorption
- Ruminant animal herds can develop severe magnesium deficiency from overgrowth of specific strains of ruminal bacteria that produce tricarballylate
- The disease is caused by overfeeding high-carbohydrate herbage

IF TRICARBALLYLATE HIGH:
Causes: Intestinal bacterial overgrowth, Associated with high dietary carbohydrate, Probably due to microaerophilic bacteria

Symptoms/Conditions
Elements tightly bound by tricarballylate causing decreased intestinal absorption

(Magnesium, Calcium, Zinc)

TREATMENT:
- Magnesium, 400mg/day
- Calcium 800mg/day
- Zinc 40mg/d
- Restricted carbohydrate diet

Cit Acid Cycle Metabs Comment

Pyruvate is the anaerobic breakdown product of glucose. Its further conversion to acetyl-CoA requires the pyruvate dehydrogenase enzyme complex. Pyruvate dehydrogenase requires cofactors derived from thiamin, riboflavin, niacin, lipoic acid, and pantothenic acid for optimal function.
Levels of pyruvate in the tissues are further controlled by the biotin-containing protein, pyruvate carboxylase, which controls the first step in the reformation of glucose from pyruvate. Multiple forms of pyruvate carboxylase deficiency, some of which are biotin responsive, have been reported.

Isocitrate Low:
This is an endproduct in the metabolism of aci-Aconitate in the Krebs Cycle. Low levels of isocitrate are suggestive of enzyme inhibition with Fluoride, Mercury, Arsenic or Tin.

SUPPLEMENTATION RECOMMENDATIONS:
The cofactors needed to up regulate the enzyme activity are: Aaspartic acid, Iron and Glutathione.

Lactate Elevated:
This metabolic precursor to the Citric Acid Cycle, may indicate a block in the production of energy. Can also be indicative of an on-going infectious state, use of some recreational and/or pharmaceutical drugs, alcohol over consumption, poor blood sugar control (especially with diabetics), and a number of inborn errors of metabolism.

SUPPLEMENTATION RECOMMENDATIONS:
CoQ10, thiamin (Vit B1), riboflavin, niacin, lipoic acid, and pantothenic acid.
cis-Aconitate Elevated:
An intermediate of the citric acid cycle, an elevated level of this organic acid may be an indication of poor supplies or metabolism of amino acids. A clinical sign is fatigue.
If elevated with orotate, isocitrate and citrate, suspect hyperammonia.

SUPPLEMENTATION RECOMMENDATIONS:
alpha Lipoic Acid, Vitamin B Complex, Cysteine, Iron, Magnesium, Manganese.

Malate Comment:
A high level of this organic acid may be indicative of a need for certain nutrients such as niacin (B3) and Coenzyme Q10.
A low level of this organic acid may be indicative of the need for aspartic acid.

OA Cofactor Need Comment

Hydroxymethylglutarate Comment:
This organic acid, when high, may be indicative of a low level of Coenzyme Q10 or poor synthesis.

p-HYDROXYPHENYL ACETATE (HPLA) COMMENT:
PHPLA is an organic acid present with increased cell proliferation and pro-oxidant production. It is also associated with carcinogenesis, binding to nuclear estrogen receptor. It is also a metabolite of tyrosine and a marker for the depletion of methyl-p-hydroxyphenyllactate (MeHPLA), an important cell growth-inhibiting agent

IF HPLA HIGH:
Causes:
Increased level of oxidative challenge, Increased tissue growth response, Associated with cancer or normal tissue growth.

Symptoms/conditions:
Early onset of aging related effects, Leukemia, Breast cancer, High HPLA results in dramatically decreased vitamin C concentration in the liver, adrenal glands and blood

Treatment:
Vitamin C-gram quantities -100mg/kg body weight daily or to bowel tolerance)
Other antioxidants (Vitamin E, lipoic acid)
CoQ10 60-300mg/day

8-Hydroxy-2'- deoxyguanosine (8-OHdG)
" Normal product of DNA oxidative damage and repair
" A repair product of the highly mutagenic oxidation of guanine in DNA or the cellular pool of GTP

BENZOATE COMMENT
- Hepatic Phase II conjugation
- Bacterial deamination of the amino acid phenulalanine produces benzoate.

IF BENZOATE HIGH:
Causes:
- Inadequate conversion to hippurate in the liver
- Glycine and pantothenic acid are the rate limiting factors
- Should not be high if hepatic glycine conjugation is efficient because benzoate is rapidly converted to hippurate
- Intestinal bacterial overgrowth
- Confirmed by simultaneous elevation of other bacterial markers
- Ingestion of benzoic acid - a common food component
- Suspect when other bacterial markers are not elevated
- Preservative in manufactured/processed and packeaged foods: Pickles, Soda, Lunchmeats
- Natural ingredients of cranberries
- Malabsorption of phenylalanine due to low HCI in stomach

Treatment:
" Glycine 3g/day
" Pantothenic acid 500 g/day

Dopaminergic Activity Comment

[HVA] (Homovanillate) a Dopamine catabolite - is HIGH
Elevated levels of homovanillate may be due to amino acid deficiencies, the use of L-Dopa as a treatment for Parkinson's disease, copper deficiency (especially if Vit A is low), cocaine or amphetamine use or chronic depletion of Tyrosine.
Reflects the increased rate of synthesis and degradation in normal tissue.
Drugs that may have an adverse effect to the result: Aspirin.
Symptoms and Conditions: Agitation, delirium, psychosis.
Treatment: Supplement with Tyrosine 2x daily 500mg. This amino acid is essential to the synthsis of protein, catecholamines, melanin and thyroid hormones. Vitamin C and Folate are essential to its metabolism. The formation of thyroid hormone is dependent upon the absorption and sequestering of iodine which then attaches to tyrosine to form thyroxine.
Supplement with broad spectrum essential amino acids. Stop related drug use.

Adrenergic Activity Comment	Vanilmandelate is a metabolite of both epinephrine and norepinephrine.
Serotonergic Activity Comment	[5HIAA] is within range. This is the major metabolite of Serotonin.

Creatinine, Urine Spot.	**9.1**	5.0 - 13.0	mmol/L