



3856140

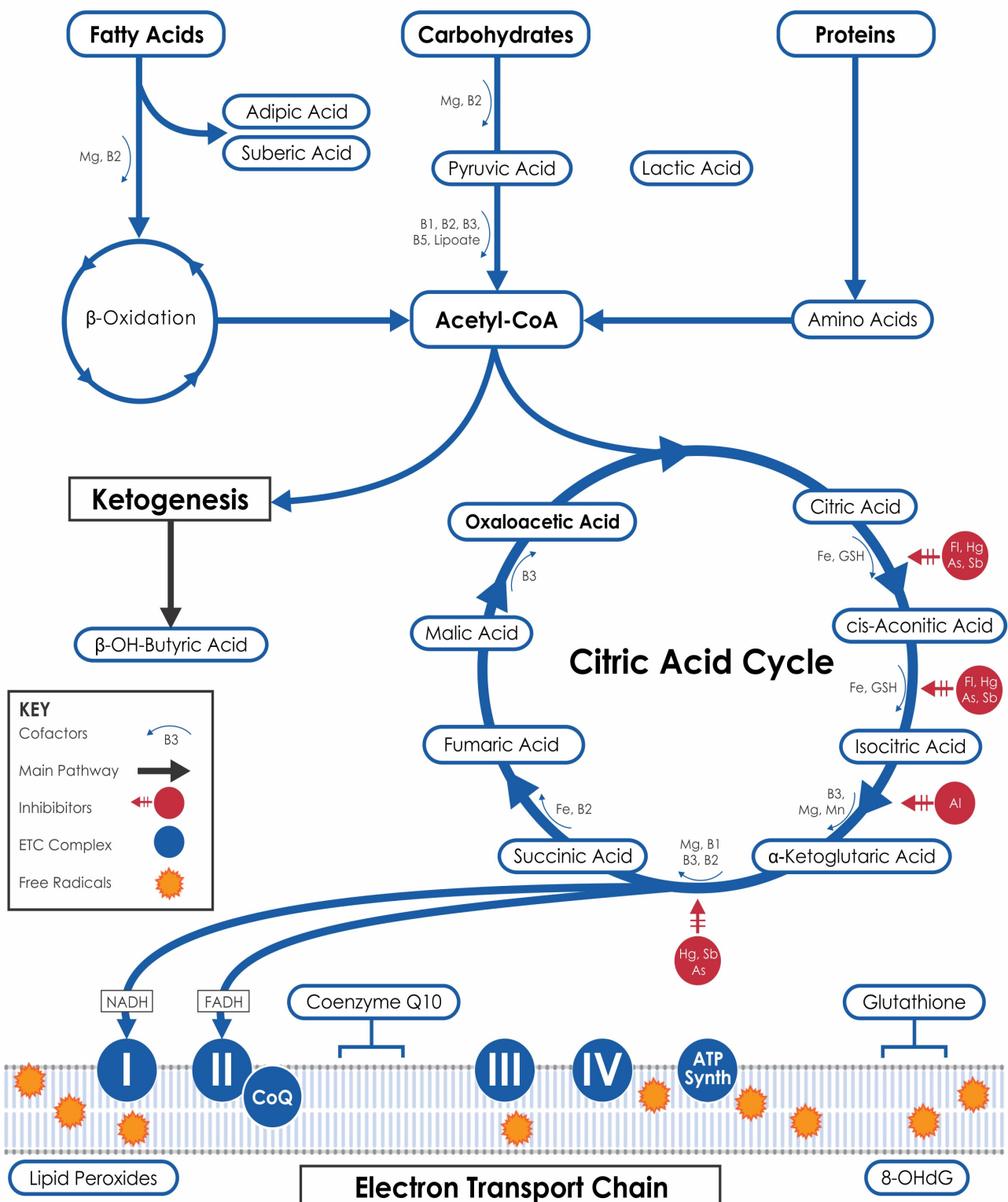
P: 1300 688 522
E: info@nutripath.com.au

-VERA DAHLSTROM
RESTORING VITALITY NATUROPATHIC
CLINIC
2 TOROKINA STREET

ORGANIC ACIDS METABOLOMIC MAPPING

Method: LCMS/MS/MS

Organic Acids Pathways



**NutriPATH**

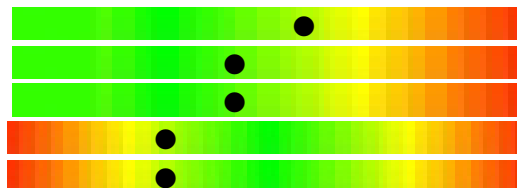
INTEGRATIVE PATHOLOGY SERVICES

MARIAN CAVANAGH**28-Apr-1970****Female****16/31 DUTTON STREET
COOLANGATTA QLD 4225****LAB ID : 3856140
UR NO. : 6163855
Collection Date : 24-Nov-2022
Received Date:29-Nov-2022****3856140****P: 1300 688 522
E: info@nutripath.com.au****-VERA DAHLSTROM
RESTORING VITALITY NATUROPATHIC
CLINIC
2 TOROKINA STREET****Nutrient Markers**

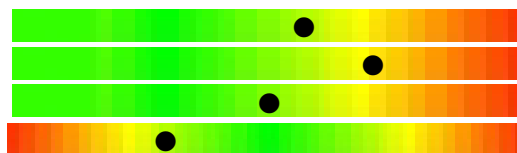
URINE, SPOT

KETONE/FATTY ACID Metabolites*(Carnitine & B2)*

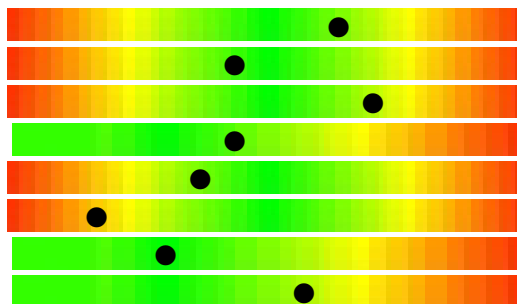
1. Adipic Acid.	8.14	0.00 - 11.10 ug/mgCR
2. Suberic Acid.	2.44	0.00 - 4.60 ug/mgCR
3. Ethylmalonic Acid	2.80	0.00 - 6.30 ug/mgCR
4. Pimelic Acid	11.5	5.9 - 31.8 nmol/mg Cr
5. Methyl-Succinic Acid	8.64	3.20 - 21.10 nmol/mg Cr

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

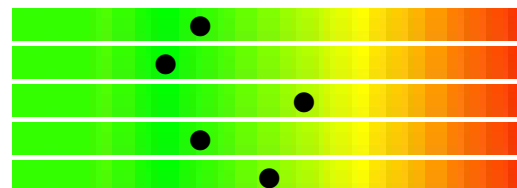
6. Pyruvic Acid.	4.50	0.00 - 6.40 ug/mgCR
7. Lactic Acid.	16.73 *H	0.00 - 16.40 ug/mgCR
8. b-OH-Butyric Acid	5.60	0.00 - 9.90 ug/mgCR
9. Glucose (OA)	0.3	0.1 - 1.1 mmol/L

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

10. Citric Acid.	826.7	56.0 - 987.0 ug/mgCR
11. cis-Aconitic Acid.	51.1	18.0 - 78.0 ug/mgCR
12. Isocitric Acid.	141.6	35.0 - 143.0 ug/mgCR
13. a-Ketoglutaric Acid.	18.29	0.00 - 35.00 ug/mgCR
14. Succinic Acid	8.75	1.10 - 20.90 ug/gCR
15. Fumaric Acid.	1.11	1.10 - 1.35 ug/mgCR
16. Malic Acid.	0.83	0.00 - 3.10 ug/mgCR
17. b-OH-b-Methylglutaric Acid	3.73	0.00 - 5.10 ug/mgCR

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

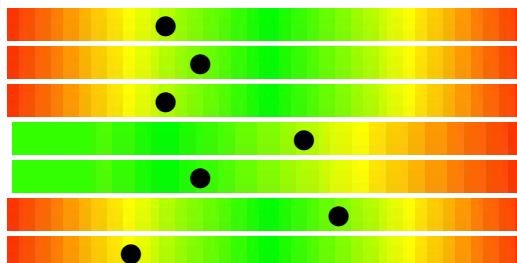
18. a-Ketoisovaleric Acid	0.21	0.00 - 0.49 ug/mgCR
19. a-Ketoisocaproic Acid	0.14	0.00 - 0.52 ug/mgCR
20. a-Keto-b-Methylvaleric Acid	0.89	0.00 - 1.10 ug/mgCR
21. Xanthurenic Acid	0.18	0.0 - 0.5 ug/mgCR
22. beta-Hydroxyisovaleric Acid	6.74	0.00 - 11.50 ug/mgCR

**METHYLATION COFACTORS***(B12, Folate)*

23. Methylmalonic Acid.	0.83	0.00 - 2.30 ug/mgCR
24. Formiminoglutamic Acid **	0.2	0.0 - 2.2 ug/mgCR

**Cell Regulation Markers****NEUROTRANSMITTER METABOLISM***(Tyrosine, Tryptophan, B6, Antioxidants)*



25. Homovanillic Acid (HVA)	3.27	1.40 - 7.60 ug/mgCR
26. Vanillylmandelic Acid (VMA)	2.99	1.20 - 5.30 mmol/molCr
27. 5-Hydroxyindoleacetic Acid (5HIAA)	3.20	1.60 - 9.80 ug/mgCR
28. Kynurenic Acid.	1.04	0.0 - 1.5 ug/mgCR
29. Quinolinic Acid (OA)	2.05	0.00 - 5.80 ug/mgCR
30. Picolinic Acid	12.3	2.8 - 13.5 ug/mgCR
31. Cortisol (OA)	210	166 - 507 nmol/L





Oxidative Damage/AntiOxidant Markers






(Vitamin C and Other Antioxidants)

32.	ParaHydroxyphenyllactate	<dl	0.00 - 0.66 ug/mgCR	
33.	8 OH-deoxyguanosine	4.0	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.	0.34	0.00 - 1.01 ug/mgCR	
36.	Glucaric Acid.	1.70	0.00 - 10.70 ug/mgCR	
37.	a-OH-Butyric Acid	0.40	0.10 - 0.90 ug/mgCR	
38.	Pyroglutamic Acid.	50.0	28.0 - 88.0 ug/mgCR	

Compounds of Bacterial or Yeast/Fungal Origin

BACTERIAL DYSBIOSIS MARKERS.

39.	Benzoate (OA)	16.30 *H	0.00 - 9.30 ug/mgCR	
40.	Hippurate (OA)	714	0.0 - 1070 ug/mgCR	
41.	Phenylacetate	<dl	0.0 - 0.2 ug/mgCR	
42.	Phenylpropionate	<dl	0.0 - 0.1 ug/mgCR	
43.	ParaHydroxyBenzoate	1.9 *H	0.0 - 1.8 ug/mgCR	
44.	p-HydroxyPhenylacetate	2.8	0.0 - 34.0 ug/mgCR	
45.	Indoleacetic Acid	92.0 *H	0.00 - 90.00 ug/mgCR	
46.	Tricarballic acid	0.74	0.00 - 1.41 ug/mgCR	




L. acidophilus/General Bacteria

47.	D-Lactate	2.2	0.0 - 4.1 ug/mgCR	
-----	-----------	-----	-------------------	--




CLOSTRIDIAL SPECIES

48.	Dihydroxyphenylpropionic Acid	<dl	0.00 - 0.05 ug/mgCR	
49.	4-Cresol	1.0	0.0 - 75.0 mmol/molCr	
50.	3-OH-Propionic Acid	107.6	0.0 - 208.0 mmol/molCr	








YEAST/FUNGAL DYSBIOSIS MARKERS.

51.	Arabinitol	70.0	0.0 - 73.0 ug/mgCR	
52.	Citramalic Acid	0.6	0.0 - 3.6 mmol/molCr	
53.	Tartaric Acid.	0.1	0.0 - 7.0 ug/mgCR	

Oxalate Metabolites

54.	Oxalic Acid	3.30	0.77 - 7.00 ug/mgCR	
55.	Glyceric Acid	24.3	16.0 - 117.0 mmol/molCr	
56.	Glycolic Acid	17.7	6.8 - 101.0 mmol/molCr	

Nutritional Markers

57.	Pyridoxic Acid (Vit B6)	14.5	5.0 - 34.0 mmol/molCr	
58.	Pantothenic Acid (Vit B5)	7.1	2.0 - 10.0 mmol/molCr	
59.	Glutaric Acid (Vit B2) **	0.3	0.0 - 0.4 mmol/molCr	
60.	Ascorbic Acid (Vit C)	122	10.0 - 200 mmol/molCr	
61.	CoEnzyme-Q10 (CoQ10) **	14.94	0.17 - 39.00 mmol/molCr	
62.	N-Acetylcysteine (NAC)	0.14	0.10 - 0.28 mmol/molCr	
63.	Biotin (Vit H)	0.29	0.19 - 2.70 mmol/molCr	

Creatinine, Urine Spot.	4.2 *L	5.0 - 11.0 mmol/L	
-------------------------	--------	-------------------	--

Results reported as <dl = Less than detectable limit ** A high value for this marker may indicate a deficiency of this vitamin

**NutriPATH**

INTEGRATIVE PATHOLOGY SERVICES

MARIAN CAVANAGH**28-Apr-1970****Female****16/31 DUTTON STREET
COOLANGATTA QLD 4225****P: 1300 688 522****E: info@nutripath.com.au****-VERA DAHLSTROM
RESTORING VITALITY NATUROPATHIC
CLINIC
2 TOROKINA STREET****LAB ID : 3856140
UR NO. : 6163855
Collection Date : 24-Nov-2022
Received Date:29-Nov-2022****3856140****Nutritional Guide**

Nutrient	Adult Dose Range	Units	Clinician Notes
Vitamin-B1	15.0	mg	
Vitamin-B2	200.0	mg	
Vitamin-B3	500.0	mg	
Vitamin-B5	200.0	mg	
Vitamin-B6	15.0	mg	
Biotin.	300.0	ug	
Chromium .	200.0	ug	
Magnesium .	375.0	mg	
Coenzyme Q10.	300.0	mg	
alpha Lipoic Acid.	600.0	mg	
Acetyl-L-Carnitine.	500.0	mg	
N-Acetylcysteine.	450.0	mg	
Glutathione.	450.0	mg	
Lysine.	375.0	mg	
L-Arginine.	2000.0	mg	
Glycine .	1000.0	mg	
Ornithine.	625.0	mg	
Probiotics (Multistain)	15.0	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.



Laboratory Comments

Ketone/FA Metabolites Comment

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.

FATTY ACID METABOLISM:

Adipate, suberate, pimelate, Ethylmalonate and 2-methylsuccinate are organic compounds from fatty acid metabolism. Long chain fatty acids (LCFAs) undergo beta-oxidation in the mitochondria which is carnitine dependant. Dietary fat is broken down to produce free fatty acids, energy substrates using pathways that require carnitine and vitamin B2 (Riboflavin).

Low levels of Ethylmalonate with high adipate and suberate may be associated with carnitine deficient hypometabolic states where multiple amino acid catabolic pathways are restricted due to mitochondrial retraction.

Carbohydrate Metabolism Comment

CARBOHYDRATE METABOLISM/GLYCOLYSIS:

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), vitamin 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.

LACTATE ELEVATED:

This metabolic precursor to the Citric Acid Cycle, may indicate a block in the production of energy due to mitochondrial disorders, 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:

B Vitamins (B1, B2, B3, B5), lipoic acid, and CoQ10.

Cit Acid Cycle Metabs Comment

The Citric Acid Cycle is the pathway for energy released from food components and the source of anabolic molecules to support organ maintenance and neurological function. Therefore, the citric acid cycle serves both anabolic and catabolic functions representing the crossroads of food conversion and utilisation.

B-Vitamins/Amino Acids Comment

B-COMPLEX VITAMIN MARKERS:

B-Complex Vitamin Markers are metabolic intermediates in the degradation of amino acids. When hepatic enzymes remove branched-chain amino acids, they form keto acids.



B-complex vitamins are essential for many in metabolic functions in the body used to extract energy from cellular health, remove toxins, and maintain the immune system.
B-Complex vitamin deficiencies produce symptoms associated with homocysteinemia effects or mitochondriopathy-associated symptoms which include periodic weakness, nausea, fatigue, attention deficit or Reye syndrome.

Neurotransmitter Metabolism Comment

5HIAA IS WITHIN RANGE:
5HIAA is the major metabolite of Serotonin.

Detoxification/Toxicants Comment

OXIDATIVE DAMAGE AND ANTIOXIDANT MARKERS:
The assessment of protection from oxidant and ammonia challenge should be of priority when detoxification requirement is suspected. Oxidative stress has been associated with a variety of diseases like diabetes, cancer, neurodegenerative disorders and aging.

DETOXIFICATION INDICATORS:
The organic acids of this group serve as biomarkers of detoxification status or biotransformation capacities, distinct parts of the detoxification system, providing insight about both exogenous toxin accumulation and endogenous detoxification responses.
Elevations in toxicant and detoxification markers reveal aspects of xenobiotic exposure, endogenous toxins and detoxification functions.

Bacterial Dysbiosis Comment

BENZOATE ELEVATED:
- Hepatic Phase II conjugation
- Bacterial deamination of the amino acid phenylalanine produces benzoate.
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 packaged foods: Pickles, Soda, Lunchmeats
- Natural ingredients of cranberries
- Malabsorption of phenylalanine due to low HCl in stomach
Supplementation Recommendations:
Glycine 3g/day, Pantothenic acid 500 mg/day
Consider a Microbiome assessment to determine microbial overgrowth.

Para-HYDROXYBENZOATE (Parabenz Metabolite) ELEVATED:
Sources of Exposure:
Used widely as an antimicrobial, a preservative and flavorant in food, as well as cosmetic and pharmaceutical formulations to increase shelf life.
Body care products:
Sprays, fragrances, conditioners, shampoos, hair gels, deodorants, soaps, hand sanitizers, facial masks and foundations, sunscreens, self-tanners, hair removal creams and shaving gels, nail and skin creams, baby lotion.
Pharmaceuticals:
Injectable drugs, antacids, suppositories, BenadrylTM cream, hydrocortisone creams and ointments, medicated pain-relieving patches, mentholated vapor rubs, chap stick, antifungal and antibacterial preparations.



Food products:

Packaged meats, fish and poultry, mayonnaise, oils, salad dressings, catsup, pickles, relishes, processed fruits and vegetables, frozen dairy products, cakes, pies, pastries, icings, jellies and jams, beers and ciders, soft drinks, fruit juices, syrups, and some candies.

May also be derived from bacterial metabolism in the gut.

Occupational Exposure: Industrial oils, fats, glues, shoe polishes, & textiles.

Effects:

Allergic contact dermatitis, Estrogenic activity. Animal studies show decreased testosterone levels and sperm count.

Metabolism:

Alkyl esters of para-hydroxybenzoic acid, parabens, are hydrolyzed to para-hydroxybenzoate, the main metabolite of parabens, via tissue esterases found in skin, subcutaneous fat, liver and kidney.

Bioaccumulation of parabens may result from chronic exposure.

INDOLEACETIC ACID ELEVATED:

Indican (Indoleacetate) is a by-product from breakdown of tryptophan 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 or heavy dietary protein intake.

Indican excretion is reduced when the intestines are populated with strains of lactobacillus.

Consider a Microbiome assessment to determine microbial overgrowth.