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15-May-26

Clinical Notes Difficulty Sleeping, Fatigue, Brain Fog, Headaches

12-Apr-26

N/A



Dr Test Doctor (Test Doctor) Test Clinic. 123 Test Street, Test Suburb Victoria 3125

Lab ID
Patient ID P000060
Ext ID 26135-0078

Test Patient

Sex: Female • 56yrs • 01-Jan-70
123 Home Street, Test Suburb VIC 3125

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ORGANIC ACIDS INTRODUCTION

Organic acids are small carbon-based molecules produced as by-products of everyday metabolic processes in the body. They are measurable in urine and serve as functional windows into the biochemical pathways that govern energy production, detoxification, immune regulation, neurotransmitter synthesis, and nutritional status. Organic acid testing offers a uniquely deep and clinically meaningful picture of a patient's metabolic health.

The Organic Acids Test (OAT) is a comprehensive urine-based analysis that examines over 120 individual metabolic markers across the following key domains:

Microbial Overgrowth - Identifies markers associated with bacterial dysbiosis and overgrowth of potentially pathogenic organisms in the gastrointestinal tract, including phenolic and aromatic compounds produced by microbial fermentation of dietary substrates.

Yeast & Fungal Metabolites - Screens for metabolites associated with yeast and fungal overgrowth, including Candida-related markers such as arabinitol, tartaric acid, and tricarballic acid, which may interfere with mitochondrial function and nutrient absorption.

Mitochondrial & Energy Metabolism - Evaluates the functional integrity of the citric acid (TCA) cycle through measurement of key intermediates including citric acid, cis-acetic acid, isocitric acid, and alpha-ketoglutaric acid.

Fatty Acid Oxidation & Ketone Metabolism - Assesses the efficiency of both mitochondrial beta-oxidation and the alternative omega-oxidation pathway through dicarboxylic acid markers, providing insight into fatty acid handling, carnitine sufficiency, and metabolic flexibility.

Amino Acid & Branched-Chain Metabolism - Examines the catabolism of essential and branched-chain amino acids, identifying impairments in leucine, isoleucine, valine, methionine, threonine, and tyrosine pathways that may contribute to fatigue, mood dysregulation, and neurological symptoms.

Neurotransmitter Metabolism - Profiles the major catecholamine and indole pathways, including dopamine, norepinephrine, and serotonin metabolites, as well as the tryptophan-kynurenine pathway, offering functional insight into mood, cognition, stress response, and sleep regulation.

Vitamins & Nutritional Cofactor Markers - Provides functional assessment of B-vitamin status (B1, B2, B3, B5, B6, B12, folate, biotin), glutathione and antioxidant capacity, and key cofactors required for enzymatic activity across multiple metabolic pathways.

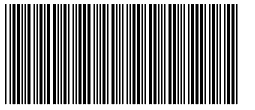
Detoxification & Glutathione Function - Evaluates markers of phase I and phase II hepatic detoxification, glutathione cycling via pyroglutamic acid, and NAC status, reflecting the body's capacity to manage oxidative burden and chemical exposure.

Oxidative Stress & Inflammation - Measures markers of DNA oxidative damage and inflammatory mediators, including 8-hydroxy-deoxyguanosine and leukotriene E4, providing a functional picture of systemic oxidative load.

Oxalate Metabolism - Screens for markers of excess oxalate production or absorption, which may be associated with gut dysbiosis, dietary factors, or impaired detoxification.

Environmental & Xenobiotic Exposures - Identifies urinary metabolites of common environmental chemicals including xylene, benzene, toluene, phthalates, parabens, and endocrine-disrupting compounds such as Bisphenol A (BPA) and Bisphenol S (BPS), providing objective evidence of toxic load.

Please Note: We acknowledge that certain compounds appear in multiple sections of the report. This is intentional, as these analytes have relevance across different clinical pathways. Their inclusion in multiple categories supports more accurate pattern recognition and enhances the interpretive value of Organic Acids testing.



26135-0078

Dr Test Docto

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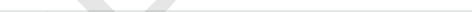
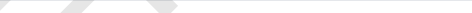
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MICROBIAL OVERGROWTH

TEST		RESULT	H/L		REFERENCE	UNITS
1	Benzoic Acid	4.80			(<9.30)	mmol/molCR
2	Hippuric Acid	188.0			(<603.0)	mmol/molCR
3	4-Hydroxybenzoic Acid (4-HBA)	0.23			(<0.57)	mmol/molCR
4	3,4-Dihydroxybenzoic Acid (3,4-DHBA)	31.00			(<45.00)	mmol/molCR
5	3-Hydroxyphenylacetic Acid (3-HPAA)	2.80			(<10.00)	mmol/molCR
6	3,4-Dihydroxyphenylpropionic Acid (DHPPA)	6.60	H		(<5.30)	mmol/molCR
7	Furancarbonylglycine	7.30	H		(<2.00)	mmol/molCR

Amino Acid Metabolism

8	Phenylacetic Acid (PAA)	1.22		(<3.90)	mmol/molCR	
9	Phenylpropionic Acid	0.04		(<0.10)	mmol/molCR	
10	3-Phenyllactic Acid (3-PLA)	0.98		(<2.00)	mmol/molCR	
11	2-Hydroxyphenylacetic Acid (2-HPAA)	11.10	H		(0.05-0.70)	mmol/molCR
12	4-Hydroxyphenyllactic Acid (4-HPLA)	12.40	H		(<3.90)	mmol/molCR

SCFA Metabolism

13	3-Hydroxypropionic Acid (3-HPA)	4.10		(<17.00)	mmol/molCR
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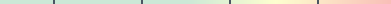
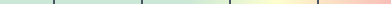
Clostridial Markers

14	4-Cresol	14.30	H		(<3.00)	ug/mgCR
15	4-Hydroxyphenylacetic Acid (4-HPAA)	3.90			(<14.60)	mmol/molCR
16	Indoleacetic Acid (IAA)	3.90			(<11.00)	mmol/molCR
17	3-(3-Hydroxyphenyl)-3-hydroxypropionic Acid (HPHPA)	41.60			(<120.00)	mmol/molCR

YEASTS & FUNGAL METABOLITES

TEST		RESULT	H/L	REFERENCE	UNITS
18	Arabinitol	18.6		(<36.0)	mmol/molCR
19	Arabinose	12.20		(<32.00)	mmol/molCR
20	Citramalic Acid	0.95		(<3.60)	mmol/molCR
21	3-Oxoglutaric Acid	0.36		(<0.50)	mmol/molCR

Aspergillus Markers

22	5-Hydroxymethyl-2-furoic Acid	22.10	H		(<10.00)	mmol/molCR
23	Furan-2,5-dicarboxylic Acid	5.20			(<15.00)	mmol/molCR
24	Tartaric Acid	6.90			(<15.00)	mmol/molCR

Fusarium

Rank	Compound	Score	Label	Bar Chart	Value	Unit
25	Tricarballic Acid	21.40	H		(<0.44)	mmol/molCR

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(B Comp, Cr, CoQ10, Lipoic Acid, Amino Acids, Mg)

TEST		RESULT	H/L		REFERENCE	UNITS
Carbohydrate & Glycaemic Metabolism						
26	Glucose (OA)	0.69			(<1.10)	ug/mgCR
27	Pyruvic Acid	1.30			(0.50-8.70)	mmol/molCR
28	Lactic Acid	10.10			(<48.00)	mmol/molCR
29	2-Hydroxybutyric Acid	38.10	H		(<6.90)	mmol/molCR
Citric Acid Cycle						
30	Citric Acid	127			(40-507)	mmol/molCR
31	cis-Aconitic Acid	31.20			(3.50-36.00)	mmol/molCR
32	Isocitric Acid	48.20			(5.00-65.00)	mmol/molCR
33	2-Oxoglutaric Acid	35.20			(2.00-45.00)	mmol/molCR
34	Succinic Acid	34.80	H		(1.00-15.00)	mmol/molCR
35	Fumaric Acid	3.90			(<8.60)	mmol/molCR
36	Malic Acid	0.44			(<1.80)	mmol/molCR
Ketone/Energy Intermediates						
37	Acetoacetic Acid	1.90			(<10.00)	mmol/molCR
38	3-Hydroxybutyric Acid	0.86			(<3.10)	mmol/molCR
39	2-Hydroxybutyric Acid	38.10	H		(<6.90)	mmol/molCR
Mitochondrial Markers						
40	Methylsuccinic Acid	2.20			(<10.80)	mmol/molCR
41	2-Methylglutaric Acid	0.22			(<0.76)	mmol/molCR
42	3-Methylglutaric Acid	2.63			(<8.50)	mmol/molCR
43	2-Hydroxyglutaric Acid	7.70			(<15.00)	mmol/molCR
44	3-Hydroxyglutaric Acid	1.45			(<5.50)	mmol/molCR
45	Malonic Acid	3.50			(<9.70)	mmol/molCR
46	Mevalonolactone	0.75			(<2.00)	mmol/molCR
47	2,4-Dihydroxybutanoic Acid	3.10			(<10.00)	mmol/molCR
48	N-Acetylaspartic Acid	1.66			(<15.00)	mmol/molCR
49	3-Methylglutaconic Acid	0.59			(<5.50)	mmol/molCR

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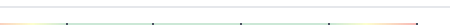
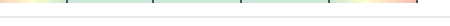
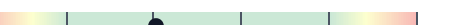
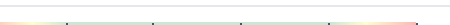
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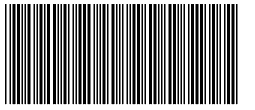
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TEST		RESULT	H/L		REFERENCE	UNITS
50	Adipic Acid	53.00	H		(<3.80)	mmol/molCR
51	Pimelic Acid	1.86			(<4.00)	mmol/molCR
52	Suberic Acid	0.48			(<2.20)	mmol/molCR
53	Azelaic Acid	3.10			(<10.00)	mmol/molCR
54	Sebacic Acid	0.15			(<0.24)	mmol/molCR
55	Ethylmalonic Acid	1.44			(<5.80)	mmol/molCR
56	Propionylglycine	0.86			(<2.00)	mmol/molCR
57	N-Butyrylglycine	0.63			(<3.00)	mmol/molCR
58	Isovalerylglycine	0.09			(<4.50)	mmol/molCR
59	N-(2-Methylbutyryl)glycine	0.12			(<2.00)	mmol/molCR
60	3-Methylcrotonylglycine	2.20			(<10.00)	mmol/molCR
61	Tiglylglycine	0.55			(<10.00)	mmol/molCR
62	Hexanoylglycine	1.47			(<10.00)	mmol/molCR
63	Suberylglycine	0.85			(<3.00)	mmol/molCR

TEST		RESULT	H/L		REFERENCE	UNITS
B-Vitamin Functional Markers						
64	Methylmalonic Acid (MMA)	1.24			(<1.90)	mmol/molCR
65	Formiminoglutamic Acid (FIGLU)	1.08			(<1.50)	mmol/molCR
66	Xanthurenic Acid	0.71			(<0.96)	mmol/molCR
67	Kynurenic Acid	72.00	H		(<2.20)	mmol/molCR
68	Quinolinic Acid	71.00	H		(<9.10)	mmol/molCR
69	Picolinic Acid	2.30			(<10.28)	mmol/molCR
70	3-Hydroxyisovaleric Acid	8.20			(<29.00)	mmol/molCR

71	Pyroglutamic Acid	74.00	H		(4.50-33.00)	mmol/molCR
72	N-Acetylcysteine (NAC)	0.17			(0.02-0.28)	mmol/molCR
73	Glutaric Acid (Vit B2)	0.11			(0.02-0.36)	mmol/molCR
74	Pantothenic Acid (Vit B5)	0.09	L		(0.10-10.00)	mmol/molCR
75	Pyridoxic Acid (Vit B6)	4.90			(0.68-34.00)	mmol/molCR
76	Ascorbic Acid (Vit C)	74.00			(0.50-200.00)	mmol/molCR
77	Methylcitric Acid (Biotin/Vitamin H)	5.10			(0.10-15.00)	mmol/molCR
78	3-Hydroxy-3-methylglutaric Acid (CoQ10)	81.00	H		(0.10-5.00)	mmol/molCR



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(B1, B2, B3, B5, B6, B12, Folate, Biotin)

TEST		RESULT	H/L		REFERENCE	UNITS
Branched-Chain Ketoacids						
81	2-Oxoisovaleric Acid	1.26			(<4.10)	mmol/molCR
82	2-Oxoisocaproic Acid	0.21			(<0.65)	mmol/molCR
83	3-Methyl-2-oxovaleric Acid	0.55			(<2.00)	mmol/molCR
84	3-Methylglutaric Acid	2.63			(<8.50)	mmol/molCR
85	Succinylacetone	0.03			(<0.50)	mmol/molCR
Downstream Metabolites						
86	2-Hydroxyisovaleric Acid	1.12			(<4.10)	mmol/molCR
87	2-Hydroxyisocaproic Acid	0.63			(<1.50)	mmol/molCR
88	2-Oxobutyric Acid	2.20			(<7.00)	mmol/molCR
89	2-Oxo-4-methiolbutyric Acid (KMBA)	92.00	H		(<1.50)	mmol/molCR
Amino Acid Metabolism						
90	Phenylpyruvic Acid	93.00	H		(<2.00)	mmol/molCR
91	Homogentisic Acid	0.47			(<1.00)	mmol/molCR
92	N-Acetylphenylalanine	1.15			(<5.00)	mmol/molCR
93	Mandelic Acid	145.0			(<340.0)	ug/gCR
94	Malonic Acid	3.50			(<9.70)	mmol/molCR
95	4-Hydroxyphenyllactic Acid (4-HPLA)	12.40	H		(<3.90)	mmol/molCR
96	2-Oxoadipic Acid	0.81			(<2.00)	mmol/molCR
97	Guanidinoacetic Acid	1100.00	H		(0.50-3.00)	mmol/molCR
98	Guanidinobutyric Acid	0.22			(0.10-1.00)	mmol/molCR
99	3-Methylglutaric Acid	2.63			(<8.50)	mmol/molCR
100	N-Acetylglycine	0.79			(<5.00)	mmol/molCR

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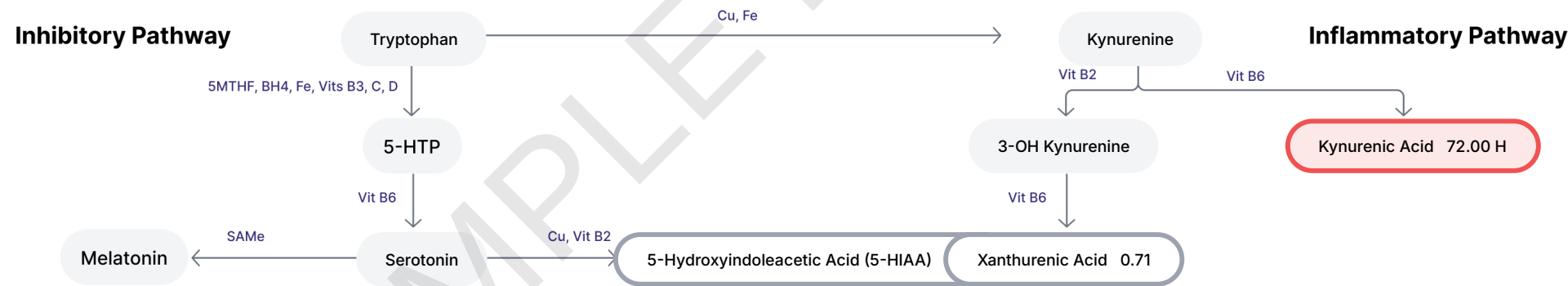
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TRYPTOPHAN/KYNURENINE PATHWAY

(Tryptophan, B6, Antioxidants)

TEST	RESULT	H/L	REFERENCE	UNITS
Inhibitory				
109	5-Hydroxyindoleacetic Acid (5-HIAA)	2.89	 (<4.30)	mmol/molCR
Inflammatory				
110	Kynurenic Acid	72.00	H  (<2.20)	mmol/molCR
111	Quinolinic Acid	71.00	H  (<9.10)	mmol/molCR
112	Picolinic Acid	2.30	 (<10.28)	mmol/molCR
113	Xanthurenic Acid	0.71	 (<0.96)	mmol/molCR
114	Kynurenic/Quinolinic Ratio	1.0	 (<2.0)	ratio
115	Quinolinic Acid/5-HIAA Ratio	24.6	H  (<5.0)	ratio

Legend Not Tested Within Range Out of Range L = Low, LL = Critically Low H = High, HH = Critically High Regulator Enzyme



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DETOXIFICATION & GLUTATHIONE FUNCTION

(Arg, NAC, Meth, Mg, Antioxidants)

TEST	RESULT	H/L	REFERENCE	UNITS
Ammonia Metabolism				
116 Orotic Acid	0.88		(<3.20)	mmol/molCR
Glutathione Metabolism				
117 Pyroglutamic Acid	74.00	H	(4.50-33.00)	mmol/molCR
118 N-Acetylcysteine (NAC)	0.17		(0.02-0.28)	mmol/molCR
119 Glucaric Acid	4.85		(<11.00)	mmol/molCR
Phase I / Xenobiotic Markers				
120 2-Hydroxyhippuric Acid	0.79		(<1.50)	mmol/molCR
121 5-Hydroxymethyl-2-furoic Acid	22.10	H	(<10.00)	mmol/molCR
122 Furan-2,5-dicarboxylic Acid	5.20		(<15.00)	mmol/molCR

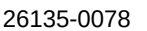
OXIDATIVE STRESS & INFLAMMATION

(Vitamin C, Other Antioxidants)

TEST	RESULT	H/L		REFERENCE	UNITS
123 8-hydroxy-deoxyguanosine	0.93			(<2.70)	umol/molCR
124 Leukotriene E4	48.60			(<100.00)	pg/mgCR
125 Quinolinic Acid	71.00	H		(<9.10)	mmol/molCR
126 Pyroglutamic Acid	74.00	H		(4.50-33.00)	mmol/molCR
127 Ascorbic Acid (Vit C)	74.00			(0.50-200.00)	mmol/molCR
128 Quercetin	0.19			(0.01-2.00)	mmol/molCR

OXALATE METABOLISM

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Nutrition Guide			
Service	Nutritional Need	Dose	Units
Amino Acids			
5-HTP	HIGH	80.0	mg
Acetyl-L-Carnitine	Adequate	0.0	mg
L-Arginine	Adequate	0.0	mg
Aspartic Acid	Adequate	0.0	mg
Glutamine	Adequate	0.0	mg
Glycine	Adequate	0.0	mg
Lysine	Adequate	0.0	mg
Methionine	Adequate	0.0	mg
Ornithine	Adequate	0.0	mg
Phenylalanine	Adequate	0.0	mg
Serine	Adequate	0.0	mg
Taurine	Adequate	0.0	mg
Tryptophan	Adequate	0.0	mg
Tyrosine	Adequate	0.0	mg
Probiotics			
D-Lactate-free probiotics	Mild	20.0	billion CFU
Lactobacillus	HIGH	40.0	billion CFU
Probiotics (Multistrain)	Mild	20.0	billion CFU
Other			
Malic Acid	Adequate	0.0	mg
EPA/DHA	Adequate	0.0	mg
Folinic Acid	Adequate	0.0	ug

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This report does not diagnose, treat, cure, or prevent any disease or medical condition.

Nutritional Guide Practitioner Notes



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Bacterial Dysbiosis Comment

DIHYDROXYPHENYLPROPIONIC ACID ELEVATED (URINE):

Elevated urinary dihydroxyphenylpropionic acid suggests increased microbial metabolism of dietary polyphenols or altered handling of aromatic compounds within the gut. This metabolite is commonly produced by intestinal bacteria from plant-derived phenolic substrates.

Clinically, elevated dihydroxyphenylpropionic acid may be associated with gastrointestinal symptoms such as bloating or altered bowel habits, as well as non-specific symptoms including fatigue or chemical sensitivity, although findings are often asymptomatic.

From an organic acid pattern perspective, elevated dihydroxyphenylpropionic acid may be observed alongside other aromatic and polyphenol-derived metabolites, such as hippuric acid or phenylacetic acid, reflecting increased microbial fermentation activity within the gut.

From a functional medicine perspective, this finding should be interpreted in the context of dietary polyphenol intake, gut microbiome balance, and intestinal transit rather than as a marker of pathology in isolation.

FURANCARBONYLGLYCINE ELEVATED:

Furancarboxylglycine (FCG) is a glycine-conjugated metabolite formed during the hepatic detoxification of furan-derived compounds, which are commonly generated during the thermal processing of foods and from certain environmental exposures.

Elevated urinary furancarboxylglycine may reflect increased exposure to furan-containing compounds, with subsequent metabolism via glycine conjugation pathways and renal excretion. This is most commonly associated with dietary intake of heat-processed foods, although environmental sources may also contribute.

As a phase II detoxification product, this marker primarily reflects exposure and metabolic processing rather than intrinsic metabolic dysfunction, and is therefore non-specific when interpreted in isolation.

Suggested Treatment Considerations:

Consider review of dietary intake, particularly consumption of highly processed or heat-treated foods. Assessment of environmental exposures may be appropriate where clinically indicated. No specific medical intervention is typically required beyond addressing identifiable sources. Interpretation should be guided by the overall clinical context and associated findings.

2-HYDROXYPHENYLACETIC ACID ELEVATED:

2-Hydroxyphenylacetic acid is a phenolic metabolite derived from the metabolism of the amino acid tyrosine, arising through combined host and gastrointestinal microbial pathways. It represents a minor urinary metabolite reflecting aromatic amino acid metabolism and microbial activity.

Elevated urinary 2-hydroxyphenylacetic acid may be associated with increased microbial metabolism of tyrosine within the gastrointestinal tract, and may be observed in the context of altered gut microbial activity or dysbiosis. In addition, elevations may reflect increased substrate availability or altered host metabolism of aromatic amino acids.

This marker is non-specific and should be interpreted in conjunction with other phenolic metabolites and markers of gastrointestinal function to assess potential patterns of microbial metabolism.

Suggested Treatment Considerations:

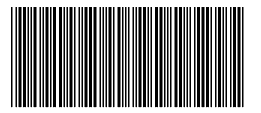
Consider correlation with other markers of microbial metabolism and gastrointestinal function where clinically indicated. Review dietary intake of protein and aromatic amino acids. Further evaluation of gastrointestinal health and microbial balance may be appropriate. Management should be guided by the overall clinical context and associated laboratory findings rather than the isolated marker elevation.

4-CRESOL ELEVATED (URINE):

p-Cresol is primarily produced by gut bacteria during protein fermentation (notably from tyrosine). Elevation often indicates dysbiosis and increased putrefactive metabolism, and can place additional demand on sulphation pathways.

Clinically, elevations may be associated with bloating, constipation, fatigue, brain fog, and chemical sensitivity. Interpretation should consider recent exposure timing, hydration status, and overall detoxification capacity.

From a functional medicine perspective, management focuses on improving bowel transit, reducing excessive protein putrefaction, increasing dietary fibre and polyphenols, and targeted gut microbiome support; ensure adequate sulphation support (e.g., B6, magnesium, molybdenum where indicated).



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From a functional medicine perspective, management focuses on supporting mitochondrial beta-oxidation with carnitine, riboflavin (B2), niacin (B3), magnesium, CoQ10, optimising glycaemic control, and reducing excess dietary fat load, addressing underlying contributors rather than isolated suppression of the marker.

2-HYDROXYBUTYRIC ACID ELEVATED (URINE):

Alpha-hydroxybutyric acid is linked to glutathione demand and early insulin resistance. Elevation reflects oxidative stress and altered glucose metabolism.

Clinically, elevations may be associated with fatigue, blood sugar instability, and reduced stress tolerance. Results should be interpreted alongside diet, environmental exposures, medications, and overall clinical context.

From a functional medicine perspective, management focuses on improving insulin sensitivity, supporting glutathione synthesis, and reducing oxidative load, with emphasis on reducing exposure and supporting metabolic clearance pathways.

Treatment: Treatment may involve lifestyle changes, such as diet and exercise, and ensuring adequate antioxidant intake.

B-Vitamins/Amino Acids Comment

2-OXO-4-METHYLTHIOBUTYRIC ACID ELEVATED:

Description:

2-Oxo-4-methylthiobutyric acid (KMBA; also known as α -keto- γ -methylthiobutyric acid) is the α -keto acid analogue of methionine, formed at the entry point of methionine catabolism via transamination. The reaction is catalysed by branched-chain aminotransferases, which transfer the amino group from methionine to an α -keto acid acceptor (typically α -ketoglutarate), producing KMBA. Under normal conditions, KMBA is further processed through the methionine salvage pathway to propionyl-CoA and methanethiol, ultimately entering the TCA cycle via succinyl-CoA. Elevated urinary KMBA reflects impaired downstream catabolism due to insufficient B6, B12, or folate cofactors; excess methionine substrate availability; reduced methylation capacity; or non-enzymatic generation from methionine via reactive oxygen species under conditions of elevated oxidative stress. KMBA therefore signals potential disruption at the critical junction between methionine metabolism, SAMe synthesis, transsulfuration, and glutathione production.

Clinical Significance:

Elevated KMBA indicates impaired methionine catabolism and/or transsulfuration pathway dysfunction with downstream consequences for methylation and glutathione synthesis. Reduced SAME production impairs methylation reactions essential for neurotransmitter synthesis (dopamine, serotonin, norepinephrine), DNA and histone methylation, phospholipid metabolism, and immune regulation. Impaired transsulfuration reduces cysteine availability and consequently limits glutathione production compromising phase II detoxification, antioxidant defence, and the body's capacity to manage chemical and oxidative burden. If remethylation is concurrently impaired, homocysteine may accumulate, representing an independent cardiovascular and neurological risk factor. Clinically, this pattern is associated with fatigue, cognitive impairment and brain fog, poor detoxification, chemical sensitivity, mood dysregulation, and susceptibility to inflammatory and autoimmune conditions. The combination of elevated KMBA, elevated xanthurenic acid, and low pyroglutamic acid is a strong functional indicator of B6 insufficiency as the primary driver. Plasma homocysteine and serum B12, folate, and B6 levels should be assessed to directly characterise methylation pathway status.

PHENYLPYRUVIC ACID ELEVATED:

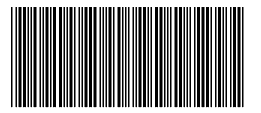
Phenylpyruvic acid is a keto-acid formed during the catabolism of phenylalanine, typically generated when phenylalanine is transaminated rather than converted via its primary metabolic pathway to tyrosine.

Elevated urinary phenylpyruvic acid may reflect impaired phenylalanine metabolism, most notably due to reduced activity of phenylalanine hydroxylase, as seen in phenylketonuria (PKU). In such cases, accumulation of phenylalanine leads to increased production of alternative metabolites, including phenylpyruvate.

Milder elevations may be observed in the context of increased phenylalanine load, altered amino acid metabolism, or metabolic stress, although these findings are non-specific and should be interpreted cautiously.

Given its clinical relevance, particularly in inherited metabolic disorders, this marker should be interpreted in conjunction with plasma amino acid profiles and other phenylalanine-related metabolites.

Suggested Treatment Considerations:



26135-0078

Lab ID
Patient ID P000060
Ext ID 26135-0078

Test Patient

Sex: Female • 56yrs • 01-Jan-70
123 Home Street, Test Suburb VIC 3125

RECEIVED
15-May-26

Description:

An elevated quinolinic acid/5-HIAA ratio reflects disproportionate tryptophan shunting through the excitotoxic kynurenine-quinolinic acid pathway at the expense of serotonin synthesis, indicating neuroinflammatory-driven tryptophan catabolism.

Clinical Significance:

Elevated ratio is a significant indicator of neuroinflammation, IDO (indoleamine 2,3-dioxygenase) enzyme upregulation, and serotonin depletion with concomitant excitotoxic stress. Associated with treatment-resistant depression, suicidal ideation, chronic fatigue, cognitive impairment, and neurodegenerative conditions. IDO is activated by pro-inflammatory cytokines (IFN- γ , TNF- α , IL-6).

Suggested Treatment:

Identify and address inflammatory triggers (gut dysbiosis, chronic infections, autoimmunity, dietary). Anti-inflammatory interventions: omega-3 fatty acids, curcumin, resveratrol. Support serotonin synthesis: L-tryptophan, 5-HTP, B6, zinc, SAME. Consider IDO-modulating strategies. Neurological and psychiatric review if symptoms are severe.

Detoxification / Oxidative Damage Comment:

PYROGLUTAMIC ACID ELEVATED (URINE):

Elevated urinary pyroglutamic acid suggests increased demand on glutathione synthesis and recycling, often reflecting oxidative stress or limited availability of glutathione precursors. Accumulation may occur when the gamma-glutamyl cycle is under increased metabolic pressure.

Clinically, elevated pyroglutamic acid may be associated with fatigue, increased sensitivity to environmental exposures, inflammatory symptoms, or impaired detoxification tolerance, although symptoms are often non-specific.

From an organic acid pattern perspective, elevated pyroglutamic acid may be observed alongside elevated oxidative stress markers such as 8-hydroxy-2-deoxyguanosine and reduced availability of sulfur-containing compounds, and may coexist with low N-acetylcysteine or altered glycine metabolism.

From a functional medicine perspective, elevated pyroglutamic acid should be interpreted in the context of oxidative burden, glutathione precursor availability, and overall redox balance rather than as an isolated abnormality.

Consider: Supplementation with glutathione or N-acetyl-cysteine.

4-HYDROXYPHENYL LACTIC ACID ELEVATED (URINE):

Elevated urinary 4-hydroxyphenyllactic acid suggests altered tyrosine metabolism, commonly driven by gut microbial activity or impaired downstream conversion pathways.

Clinically, elevated levels may be associated with fatigue, gastrointestinal disturbance, or neurocognitive symptoms, though presentations vary.

From an organic acid pattern perspective, elevation may occur alongside p-hydroxyphenylacetic acid and other aromatic metabolites, indicating increased microbial fermentation of aromatic amino acids.

From a functional medicine perspective, this finding should be interpreted in the context of gut microbial balance and overall aromatic amino acid metabolism rather than as a primary metabolic disorder.

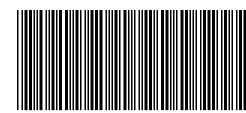
Environmental/Xenobiotic Exposure Comment:

ENVIRONMENTAL POLLUTANTS PROFILE:

The reported markers in the Environmental Pollutants Profile commonly originate from industrial/manufacturing products or their associated byproducts. Exposures are often occupationally-related and typically through either inhalation or topical exposure.

Metabolism of these products occurs via the liver detoxification pathways leading to excretion into the urine. Chronic exposures may also lead to build up of these products in fatty tissue deposits.

QUINOLINIC ACID ELEVATED (URINE):



Dr Test Doctor (Test Doctor) Test Clinic. 123 Test Street, Test Suburb Victoria 3125

Lab ID
Patient ID P000060
Ext ID 26135-0078

Test Patient

Sex: Female • 56yrs • 01-Jan-70
123 Home Street, Test Suburb VIC 3125

RECEIVED
15-May-26

Elevated urinary quinolinic acid suggests increased flux through the kynurenine pathway of tryptophan metabolism, often associated with immune activation or inflammatory signalling. Quinolinic acid is a neuroactive metabolite with excitatory properties.

Clinically, elevated quinolinic acid may be associated with neurocognitive symptoms such as brain fog, mood disturbance, irritability, sleep disruption, or heightened pain sensitivity, although symptom expression varies.

From an organic acid pattern perspective, elevated quinolinic acid is often observed alongside alterations in other tryptophan metabolites, indicating inflammatory diversion of tryptophan metabolism away from serotonin and melatonin pathways.

From a functional medicine perspective, this finding should be interpreted in the context of immune activation, inflammatory burden, and overall balance of tryptophan metabolism rather than as a primary neurological disorder.

Treatment: Treatments for high quinolinic acid focus on reducing its production and counteracting its neurotoxic effects, including dietary changes like increasing vitamin B6 and consuming antioxidants (e.g., sulforaphane, green tea polyphenols, curcumin), and supplements (melatonin, selenium, theanine).

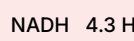
Methodology

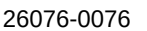
Liquid Chromatography-Mass Spectrometry (LC-MS/MS/MS), Gas Chromatography-MS (GC/MS), Automated Chemistry/Immunochemistry

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17-Mar-26

Collected
13-Mar-26

Enzyme





Dr Test Doctor (Test Doctor) Test Clinic. 123 Test Street, Test Suburb Victoria 3125

Lab ID
Patient ID P000004
Ext ID 26076-0076

Test Patient

Sex: Female • 18yrs • 20-Sep-07
123 Home Street, Test Suburb VIC 3125

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17-Mar-26

NAD/NADH

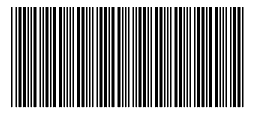
TEST	RESULT	H/L		REFERENCE	UNITS
NAD (NAD+)	8.0	L		(20.00-42.00)	nmol/ml
NADH	4.3	H		(0.60-2.20)	nmol/ml
NADP	4.8	L		(9.50-21.00)	nmol/ml
NADPH	23.0	H		(7.50-21.00)	nmol/ml

FUNCTIONAL RATIOS

TEST	RESULT	H/L		REFERENCE	UNITS
NAD/NADH Ratio	1.86	L		(8.00-45.00)	nmol/ml
NADP/NADPH Ratio	0.21	L		(0.50-2.00)	nmol/ml
NAD/NADP Index	2	L		(90.00-350.00)	nmol/ml

NAD PRECURSORS

[illegible]



26076-0076

Lab ID
Patient ID P000004
Ext ID 26076-0076

Sex: Female • 18yrs • 20-Sep-07
123 Home Street, Test Suburb VIC 3125

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17-Mar-26

NAD+ LOW:

NAD (or nicotinamide adenine dinucleotide) is used extensively in glycolysis and the citric acid cycle of cellular respiration.

The reducing potential stored in NADH can be either converted into ATP through the electron transport chain or used for anabolic metabolism. Altered NAD levels may be associated with age, cancer, obesity and type 2 diabetes, neurological disorders, intestinal inflammation. Many studies point to decreased NAD levels under disturbed nutrient conditions, and aging.

Consider: Foods which can boost NAD levels i.e. milk, fish, mushrooms, green vegetables, grains. May also supplement with 10mg niacin/nicotinic acid for a short period to increase low levels.

Strategies aimed at restoring redox balance, such as modulating NAD⁺ /NADH ratios through metabolic interventions/supplementation hold promise in mitigating oxidative stress and preserving cellular health, in overall physiological well-being.

Moderate NADPH are known to increase antioxidants, help prevent anemia, and protect the immune system. Higher NADPH levels are less common than deficiencies, and are usually not clinically-relevant. Recently however, tumor cells have been shown to maintain higher levels of NADPH, as well as an increase in anxiety and depression.

Consider: Supplementation for a short period with α -ketoglutarate or Vitamin C to lower NADPH levels.

Nicotinamide adenine dinucleotide phosphate (NADP) is a coenzyme composed of ribosylnicotinamide 5'-phosphate coupled with a pyrophosphate linkage to 5'-phosphate adenosine 2',5'-bisphosphate. NADP serves as an electron carrier in a number of reactions, being alternately oxidized (NADP⁺) and reduced (NADPH).

Nicotinamide is a form of vitamin B3 found in food and used as a dietary supplement and medication. Its primary significance is in the prevention and/or cure of blacktongue and pellagra.

Consider: Increasing high-niacin foods i.e. chicken, tuna, turkey, salmon, green vegetables. May supplement with a multivitamin.

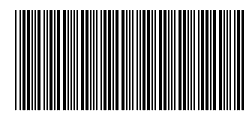
A lower ratio favors less energy, and therefore a more unfavourable NAD⁺/NADH ratio. Lower NAD⁺/NADH ratios are known to correlate with diseases of aging and mitochondrial dysfunction, such as metabolic and neurodegenerative diseases.

Consider: Foods which can boost NAD levels i.e. milk, fish, mushrooms, green vegetables, grains. May also supplement with 10mg niacin/nicotinic acid for a short period to increase low levels.

The redox theory of aging suggests that lifespan is regulated by redox changes, including alterations in the NADP⁺/NADPH ratios. Manipulations that lead to a reduction of the NADP⁺/NADPH in the cytoplasm are especially linked with increased longevity.

A niacin number (the ratio of NAD to NADP concentrations in whole blood x 100) below 130 suggests niacin deficiency.

Consider: Foods which can boost NAD levels i.e. milk, fish, mushrooms, green vegetables, grains. May also supplement with 10mg niacin/nicotinic acid if ratio is <130.



Dr Test Doctor (Test Doctor) Test Clinic. 123 Test Street, Test Suburb Victoria 3125

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Patient ID P000004
Ext ID 26076-0076

Test Patient

Sex: Female • 18yrs • 20-Sep-07
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RECEIVED
17-Mar-26

Methodology

Liquid Chromatography-Mass Spectrometry (LC-MS/MS/MS)

SAMPLE REPORT