KBMO DIAGNOSTICS

METABOLIC INSIGHTS PROFILE
NEXT GENERATION ORGANIC ACIDS

Accession Number:	URN_XXXXXX-XXXXX	**Sample Type:**	Urine
Name:	SAMPLE TEST	**Date of Collection:**	NA
Date of Birth:	NA	**Time of Collection:**	NA
Sex:	NA	**Date Completed:**	NA
Practitioner:	NA	**Date Reported:**	NA

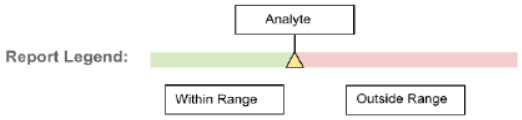
Metabolic Insights Profile

The Metabolic Insights Profile provides actionable information by analyzing urine Microbial Metabolites, Detoxification Indicators, Metabolic and Mitochondrial Function Markers, Nutritional Markers & Oxalates, and Neurotransmitter Metabolic Markers.

Reference Ranges for this test profile were established by sampling a healthy population. The mean and standard deviation were calculated, and ranges were determined to be 2 standard deviations of the mean.

Results that are elevated are noted with an "H" and a red marker appears to the left of the analyte name. Values that are below the lower limit of quantitation are designated as <LLOQ and above the upper limit of quantitation are indicated as >ULOQ.

The graphical representation of the result is a yellow triangle marking where the result falls within or outside of the reference range.



This test was developed and its performance characteristics were determined by KBMO Diagnostics, LLC. It has not been cleared by the U.S. Food & Drug Administration (FDA).

Microbial Metabolites

Metabolic Marker	Current Result (mmol/mol Cr)	Previous Result (mmol/mol Cr)	Graphical View	Ranges
Fungal Metabolites				
1. Arabitol	**75.59203**		0 45	**≤45**
2. Citramalic	**0.33967**		0 5	**≤5**
3. 5-Hydroxymethyl-2-furoic	**0.00000**		0 25	**≤25**
4. Furancarbonylglycine	**0.00000**		0 55	**≤55**
5. Furan-2,5-dicarboxylic	**0.00000**		0 3	**≤3**
6. Tricarballylate	**0.00000**		0 1.5	**≤1.5**
7. Ascorbic	**8.10465**		0 20	**≤20**
Clostridia Metabolites				
8. HPHPA	**4.54313**		0 22	**≤22**
9. m-Cresol-sulphate	**48.54655**		0 80	**≤80**
10. 3-Indoleacetic	**0.74451**		0 7.5	**≤7.5**
Bacterial Metabolites				
11. Benzoic	**0.00000**		0 3	**≤3**
12. Hippuric	**52.75804**		0 300	**≤300**
13. 4-Hydroxybenzoic	**0.70888**		0 4.5	**≤4.5**
14. 4-Hydroxyphenylacetic	**1.31918**		0 1.1	**≤1.1**
15. 4-Hydroxyphenyllactic	**0.82645**		0 4.5	**≤4.5**
Miscellaneous Microbial Metabolites				
16. Tartaric Acd	**50.41486**		0 35	**≤35**

Detoxification Indicators

Metabolic Marker	Current Result (mmol/mol Cr)	Previous Result (mmol/mol Cr)	Graphical View	Ranges
17. Pyrogluatamic	**23.78030**		0 45	**≤45**
18. N-Acetylcysteine (NAC)	**0.53515**		0 0.6	**≤0.6**
19. 8-Hydroxy-2-deoxyguanosine	**0.00134**		0 0.01	**≤0.01**
20. 2-Hydroxybutyric	**2.12740**		0 5.7	**≤5.7**
21. 2-Hydroxyhippuric	**0.50710**		0 3	**≤3**

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Metabolism & Mitocondrial Function

Metabolic Marker	Current Result (mmol/mol Cr)	Previous Result (mmol/mol Cr)	Graphical View	Ranges
Citric Acid Cycle				
22. Citric	**106.26148**		0 1000	**≤1000**
23. Cis-Aconitic	**8.93510**		0 60	**≤60**
24. Isocitric	**18.25707**		0 85	**≤85**
25. 2-Oxoglutaric	**0.00000**		0 45	**≤45**
26. Succinic	**15.36838**		0 6.5	**≤6.5**
27. Fumaric	**13.53773**		0 5.5	**≤5.5**
28. Malic	**1.34544**		0 3.5	**≤3.5**
Glycolysis Metabolism/Lactic Acid Cycle				
29. Pyruvic	**20.22243**		0 45	**≤45**
30. Lactic	**19.86612**		0 40	**≤40**
31. 2,4-dihyroxybutanoic	**141.16386**		0 30	**≤30**
Fatty Acid Metabolism				
32. Suberic	**0.70302**		0 2.2	**≤2.2**
33. Ethylmalonic	**1.78893**		0 8	**≤8**
34. 3-Hydroxybutyric	**0.00000**		0 8.5	**≤8.5**
35. Acetoacetic	**0.00000**		0 25	**≤25**
36. Methylsuccinic	**1.53047**		0 7.5	**≤7.5**
37. Sebacic	**0.04405**		0 0.7	**≤0.7**

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Nutrition & Oxalates

Metabolic Marker	Current Result (mmol/mol Cr)	Previous Result (mmol/mol Cr)	Graphical View	Ranges
Nutrients				
38. Xanthurenic	**0.00000**		0 3.5	**≤3.5**
39. 4-Pyridoxic (B6)	**11.26569**		0 3	**≤3**
40. Pantothenic (B5)	**19.53844**		0 5	**≤5**
41. Glutaric (B2)	**0.79913**		0 6	**≤6**
42. Formiminoglutamic (FIGLU)	**0.13945**		0 3.5	**≤3.5**
43. Methylmalonic (MMA)	**0.00000**		0 4.2	**≤4.2**
Pyrimidine Metabolites				
44. Uracil	**1.53612**		0 5.5	**≤5.5**
45. Thymine	**0.10066**		0 0.8	**≤0.8**
Oxalates				
46. Oxalic	**0.00000**		0 70	**≤70**
47. Glycolic	**53.42734**		0 85	**≤85**
48. Glyceric	**3.26950**		0 4	**≤4**
Inborn Errors of Metabolism				
49. 3-Methylglutaconic	**12.47444**		0 100	**≤100**
50. 2-Oxoisovaleric	**0.40228**		0 50	**≤50**
51. Malonic	**0.00000**		0 50	**≤50**
52. 2-Oxoisocaproic	**0.00000**		0 150	**≤150**
53. 2-Oxo-4-methiolbutyric	**0.27071**		0 10	**≤10**
54. 3-Hydroxy-3-Methylglutaric (CoQ10)	**0.00000**		0 50	**≤50**
55. Mandelic	**10.03496**		0 50	**≤50**
56. 3-phenyllactic	**0.00000**		0 20	**≤20**
57. Homogentisic	**2.98405**		0 40	**≤40**
58. Orotic	**0.00000**		0 25	**≤25**
59. 4-hydroxybutyric	**11.22416**		0 50	**≤50**
60. 2-Hydroxyisovaleric	**0.35505**		0 50	**≤50**
61. 2-Hydroxyisocaproic	**0.15771**		0 20	**≤20**
62. 3-Methyl-2-oxovaleric	**22.99473**		0 40	**≤40**

Neurotransmitter Metabolism Markers

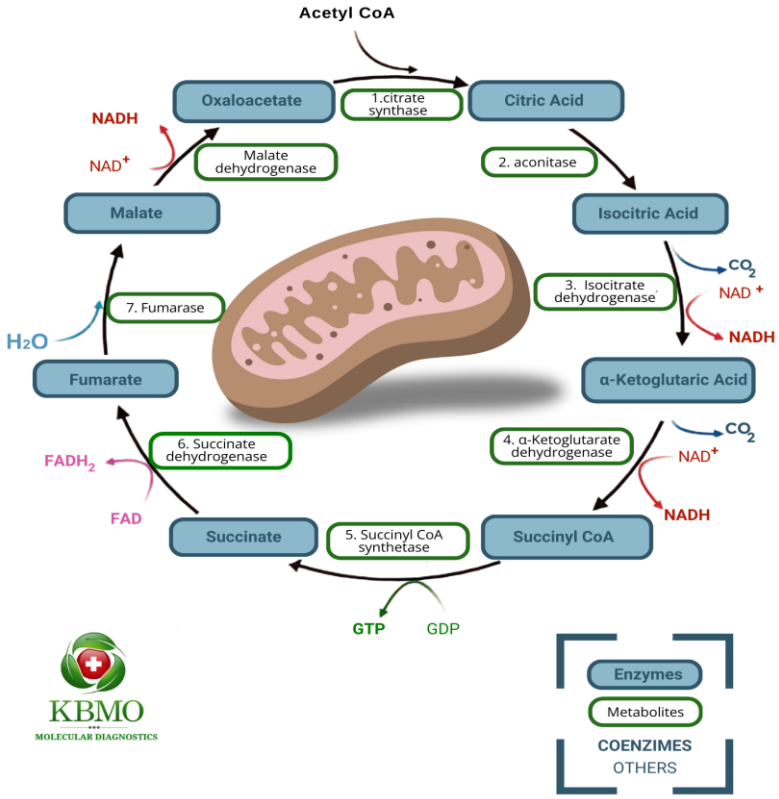
Metabolic Marker	Current Result (mmol/mol Cr)	Previous Result (mmol/mol Cr)	Graphical View	Ranges
63. Homovanilate (HVA)	**4.91708**		0 11	**≤11**
64. Vanilmandelate (VMA)	**2.19077**		0 3	**≤3**
65. HVA/VMA	**2.24445**		0 3	**≤3**
66. 5-Hydroyxindoleacetate (5-HIAA)	**1.58983**		0 6.5	**≤6.5**
67. Kynurenic	**0.01602**		0 1.6	**≤1.6**
68. Quinolinic	**3.76516**		0 1.9	**≤1.9**
69. Quinolinic/Kynurenic	**234.96635**		0 2	**≤2**

Creatinine

Metabolic Marker	Current Result (mmol/mol Cr)	Previous Result (mmol/mol Cr)	Graphical View	Ranges
70. Creatinine	**69.0**		0 250	**≤250**

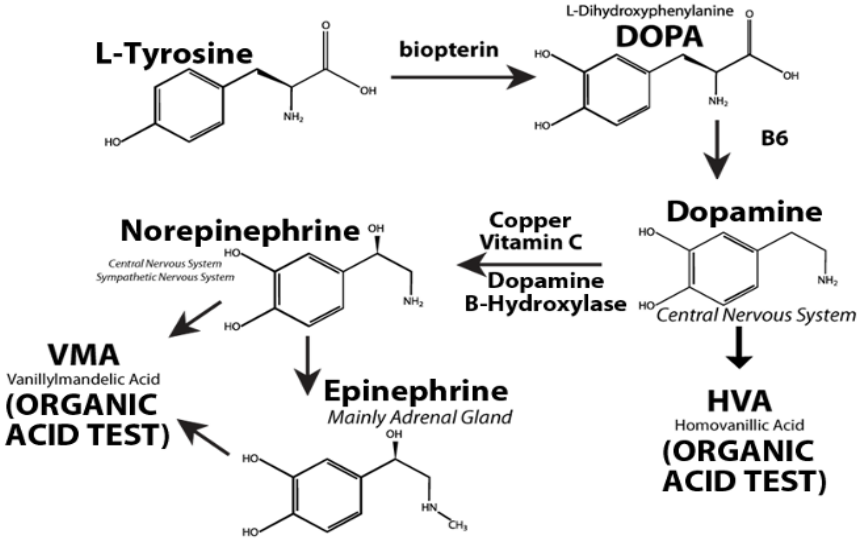
Citric Acid Cycle

Within the cell citric acid is produced in mitochondria from acetyl-coenzyme A (acetyl-CoA) and oxalacetate via the action of the enzyme citrate synthase and enters the citric acid cycle (also termed tricarboxylic acid cycle or Krebs cycle) mainly in the liver and also in skeletal muscle and renal cortex.46 The citric acid cycle is the final common pathway for the oxidation of carbohydrates, fatty acids, and amino acids. In this cycle, citric acid is used to generate energy through the oxidation of the acetyl component of acetyl-CoA derived from carbohydrates, fats, and amino acids.



Neurotransmitter Metabolism

DOPA and dopamine are metabolized into their final product, homovanillic acid (HVA), while norepinephrine and epinephrine are metabolized into vanillylmandelic acid (VMA).



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Out of Range Analytes:

Metabolic Marker	Result (mmol/mol Cr)	Previous Result (mmol/mol Cr)	
1. Arabitol	75.5920299		

Candida can produce Arabitol which is then converted to arabinose before excretion from the body. High Arabitol could indicate a candida infection or another fungal species (1, 2).

14. 4-Hydroxyphenylacetic	1.31918435		

The detection of large amounts of p-Hydroxyphenylacetate is associated with Giarddia lamblia infestation as well as other anaerobic bacterial overgrowths (20).

16. Tartaric Acd	50.4148642		

Tartaric acid can be elevated from wine, grape, apple, or several other fruit ingestions or produced by some fungi(22-24) . There is no evidence that Tartaric is a metabolite of any species of Candida.

26. Succinic	15.3683822		

Succinate is converted to Fumarate by the enzyme succinate4 dehydrogenase. This enzyme can be inhibitor by pesticides and other environmental toxins. This inhibition can lead to a buildup of succinate in the body (39). Low levels could be caused by poor dietary intake or poor absorption of branched-chain amino acids. One other possible cause is a deficiency of B12 which would lead to a decrease in the precursor succinyl-CoA (40) or from autoimmune disease(41).

27. Fumaric	13.53773		

Extremely high values are uncommon. Can lead to developmental delay, hypotonia, and microcephaly (42). Extremely low values are seen with patients with autoimmune disease (41)

31. 2,4-dihyroxybutanoic	141.16386		

Elevations in this marker could indicate early development of Alzheimer's disease. Elevations are often caused by cerebral hypoxia which are distinctly linked to Alzheimer's disease, brain tumors, or normal pressure hydrocephalus (46, 47).

39. 4-Pyridoxic (B6)	11.2656865		

Correlated with B6 intake. Low values could indicate the patient is deficient in B6 (53).

40. Pantothenic (B5)	19.5384384		

Pantothenic, which is also known as B5, is an essential vitamin. It is found in some foods and is vital in the synthesis of coenzyme A (CoA) (54).

68. Quinolinic	3.76516179		

Metabolite of tryptophan and can be both inflammatory and neurotoxic. Quinolinate can lead to neuronal dysfunction and cell death by over-exciting NMDA receptors. It also activates resident microglia and macrophage. Elevations can be caused by B6 deficiency(79).

69. Quinolinic/Kynurenic	234.966351		

High value in this ratio could indicate that tryptophan is being metabolized through the kynurenine pathway rather than the serotonin pathway (80). Higher values have been seen in patients with depression (81).