

Requisition #:	1293676	Practitioner:	RN LABS
Patient Name:	Tim Wicherts	Date of Collection:	03/01/2024
Date of Birth:	04/24/1987	Patient Age:	36
Patient Sex:	M	Time of Collection:	Not Given
		Report Date:	04/08/2024

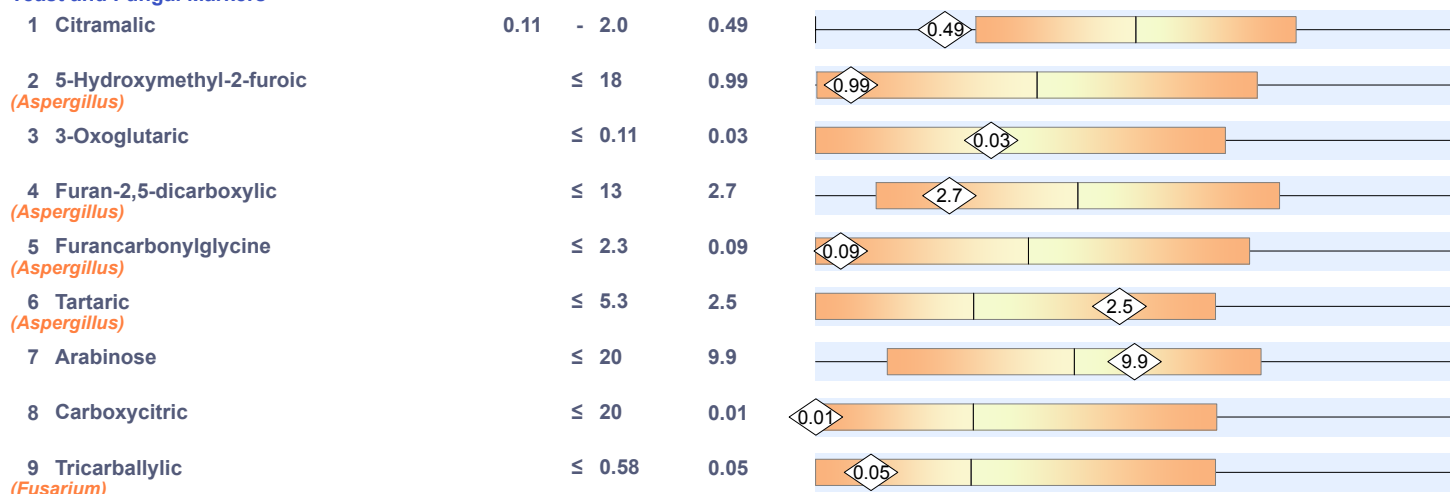


Organic Acids Test - Nutritional and Metabolic Profile

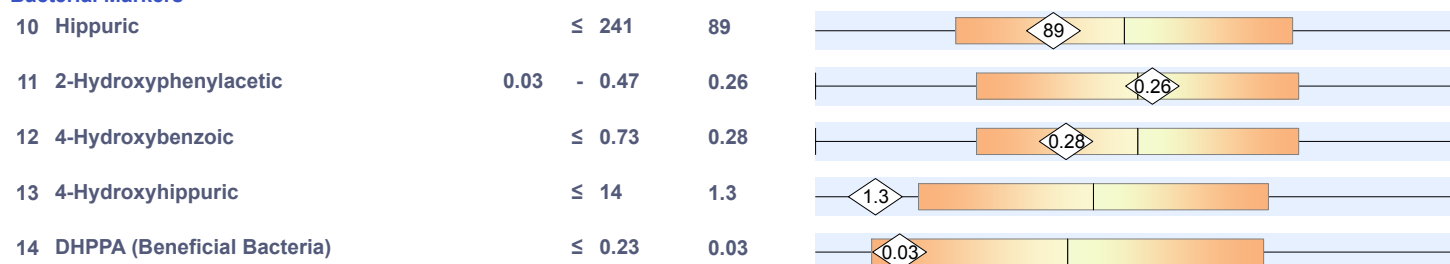
Metabolic Markers in Urine	Reference Range (mmol/mol creatinine)	Patient Value	Reference Population - Males Age 13 and Over
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Intestinal Microbial Overgrowth

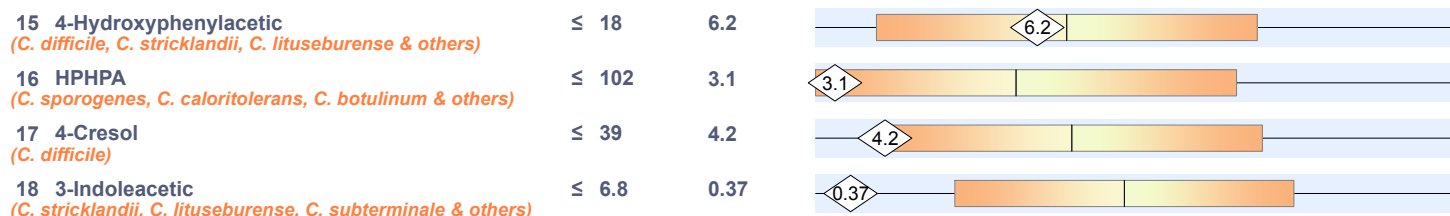
Yeast and Fungal Markers



Bacterial Markers



Clostridia Bacterial Markers

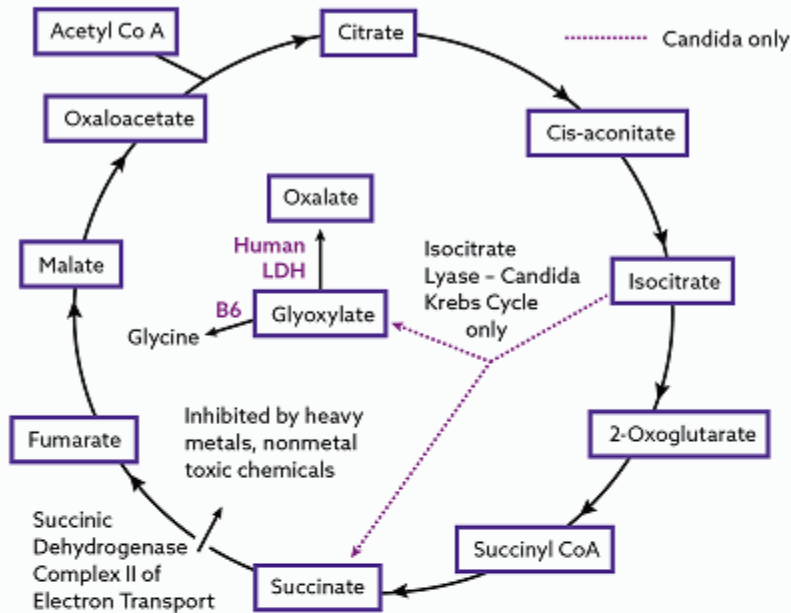


This test was developed, and its performance characteristics determined by Mosaic Diagnostics Laboratory. It has not been cleared or approved by the US Food and Drug Administration.

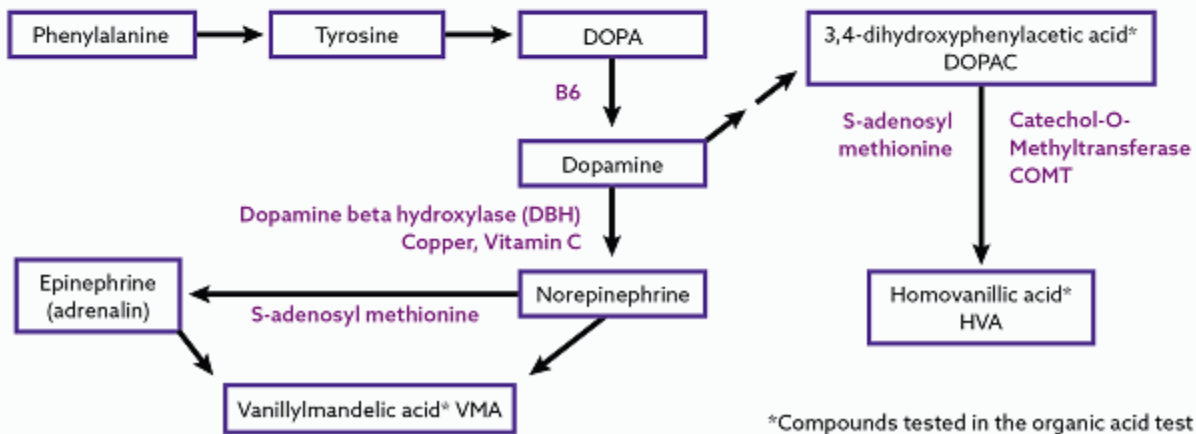
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Human Krebs Cycle showing Candida Krebs Cycle variant that causes excess Oxalate via Glyoxylate



Major pathways in the synthesis and breakdown of catecholamine neurotransmitters in the absence of microbial inhibitors

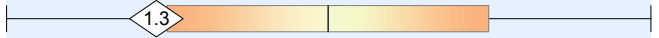
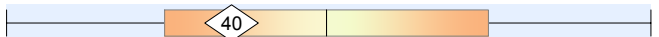
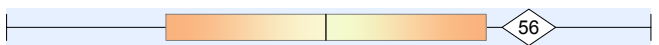


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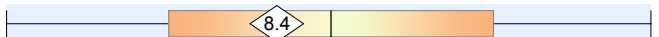
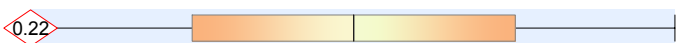
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Metabolic Markers in Urine Reference Range (mmol/mol creatinine) Patient Value Reference Population - Males Age 13 and Over

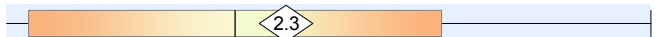
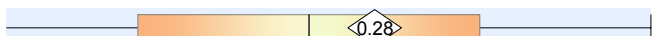
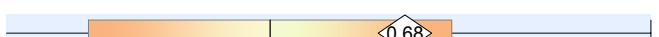


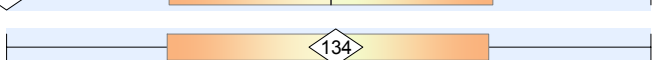
Oxalate Metabolites

19	Glyceric	0.21 - 4.9	1.3	
20	Glycolic	18 - 81	40	
21	Oxalic	8.9 - 67	56	

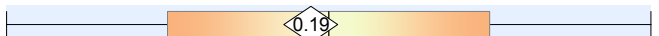

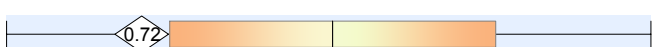
Glycolytic Cycle Metabolites

22	Lactic	0.74 - 19	8.4	
23	Pyruvic	0.28 - 6.7	L 0.22	

Mitochondrial Markers - Krebs Cycle Metabolites

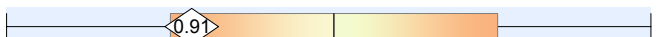
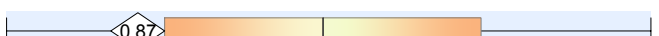
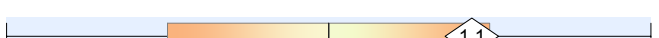
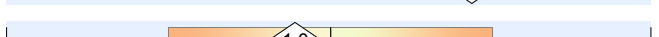
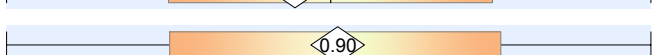
24	Succinic	≤ 5.3	2.3	
25	Fumaric	≤ 0.49	0.28	
26	Malic	≤ 1.1	0.68	
27	2-Oxoglutaric	≤ 18	6.5	
28	Aconitic	4.1 - 23	4.2	
29	Citric	2.2 - 260	134	

Mitochondrial Markers - Amino Acid Metabolites

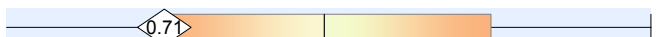
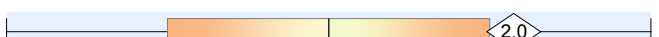
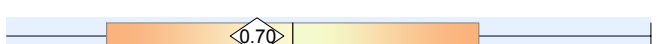
30	3-Methylglutaric	0.02 - 0.38	0.19	
31	3-Hydroxyglutaric	≤ 4.6	2.2	
32	3-Methylglutaconic	0.38 - 2.0	0.72	

Neurotransmitter Metabolites

Phenylalanine and Tyrosine Metabolites

33	Homovanillic (HVA) (dopamine)	0.39 - 2.2	0.91	
34	Vanillylmandelic (VMA) (norepinephrine, epinephrine)	0.53 - 2.2	0.87	
35	HVA / VMA Ratio	0.32 - 1.4	1.1	
36	Dihydroxyphenylacetic (DOPAC) (dopamine)	0.27 - 1.9	1.0	
37	HVA/ DOPAC Ratio	0.17 - 1.6	0.90	

Tryptophan Metabolites

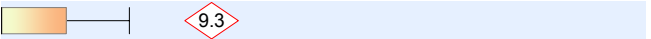
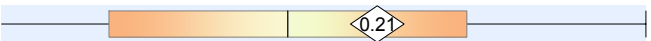
38	5-Hydroxyindoleacetic (5-HIAA) (serotonin)	≤ 2.9	0.71	
39	Quinolinic	0.52 - 2.4	2.0	
40	Kynurenic	≤ 1.8	0.70	

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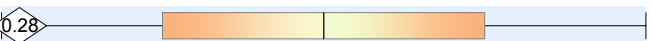
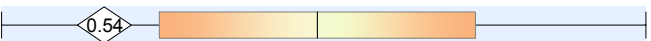

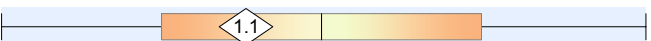
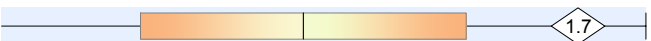
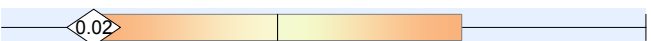
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Metabolic Markers in Urine Reference Range (mmol/mol creatinine) Patient Value Reference Population - Males Age 13 and Over

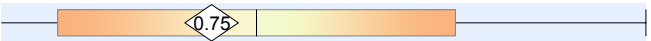

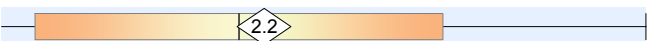
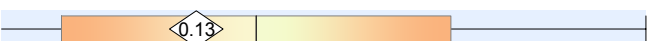
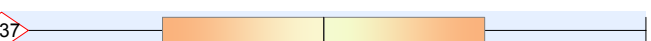
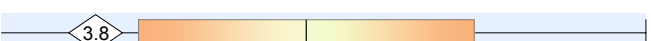
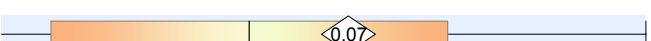
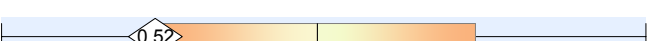
Pyrimidine Metabolites - Folate Metabolism

41 Uracil	≤ 6.9	H 9.3	
42 Thymine	≤ 0.36	0.21	

Ketone and Fatty Acid Oxidation

43 3-Hydroxybutyric	≤ 1.9	0.59	
44 Acetoacetic	≤ 10	0.28	
45 Ethylmalonic	0.13 - 2.7	0.54	
46 Methylsuccinic	≤ 2.3	0.59	
47 Adipic	≤ 2.9	1.1	
48 Suberic	≤ 1.9	1.7	
49 Sebacic	≤ 0.14	0.02	

Nutritional Markers

Vitamin B12			
50 Methylmalonic *	≤ 2.3	0.75	
Vitamin B6			
51 Pyridoxic (B6)	≤ 26	1.8	
Vitamin B5			
52 Pantothenic (B5)	≤ 5.4	2.2	
Vitamin B2 (Riboflavin)			
53 Glutaric *	≤ 0.43	0.13	
Vitamin C			
54 Ascorbic	10 - 200	L 0.37	
Vitamin Q10 (CoQ10)			
55 3-Hydroxy-3-methylglutaric *	≤ 26	3.8	
Glutathione Precursor and Chelating Agent			
56 N-Acetylcysteine (NAC)	≤ 0.13	0.07	
Biotin (Vitamin H)			
57 Methylcitric *	0.15 - 1.7	0.52	

* A high value for this marker may indicate a deficiency of this vitamin.

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Metabolic Markers in Urine Reference Range (mmol/mol creatinine) Patient Value Reference Population - Males Age 13 and Over

Indicators of Detoxification

Glutathione

58 Pyroglutamic * 5.7 - 25 17 

Methylation, Toxic exposure

59 2-Hydroxybutyric ** ≤ 1.2 0.56 

Ammonia Excess

60 Orotic ≤ 0.46 0.11 

Aspartame, salicylates, or GI bacteria

61 2-Hydroxyhippuric ≤ 0.86 0.19 

* A high value for this marker may indicate a Glutathione deficiency.
** High values may indicate methylation defects and/or toxic exposures.

Amino Acid Metabolites

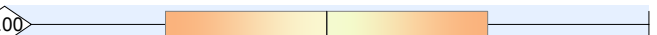
Low values are not associated with inadequate protein intake and have not been demonstrated to indicate specific amino acid deficiencies.

62 2-Hydroxyisovaleric ≤ 2.0 0.08 

63 2-Oxoisovaleric ≤ 2.0 0.10 

64 3-Methyl-2-oxovaleric ≤ 2.0 0.02 

65 2-Hydroxyisocaproic ≤ 2.0 0.45 

66 2-Oxoisocaproic ≤ 2.0 0 

67 2-Oxo-4-methiolbutyric ≤ 2.0 0.12 

68 Mandelic ≤ 2.0 0.07 

69 Phenyllactic ≤ 2.0 0.05 

70 Phenylpyruvic ≤ 2.0 0.92 

71 Homogentisic ≤ 2.0 0.01 

72 4-Hydroxyphenyllactic ≤ 2.0 0.18 

73 N-Acetylaspartic ≤ 38 2.2 

74 Malonic ≤ 9.9 2.6 

75 4-Hydroxybutyric ≤ 4.3 0.90 

Mineral Metabolism

76 Phosphoric 1,000 - 4,900 1,583 

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Indicator of Fluid Intake

77 *Creatinine 175 mg/dL

*The creatinine test is performed to adjust metabolic marker results for differences in fluid intake. Urinary creatinine has limited diagnostic value due to variability as a result of recent fluid intake. Samples are rejected if creatinine is below 20 mg/dL unless the client requests results knowing of our rejection criteria.

Explanation of Report Format

The reference ranges for organic acids were established using samples collected from typical individuals of all ages with no known physiological or psychological disorders. The ranges were determined by calculating the mean and standard deviation (SD) and are defined as $\pm 2SD$ of the mean. Reference ranges are age and gender specific, consisting of Male Adult (≥ 13 years), Female Adult (≥ 13 years), Male Child (<13 years), and Female Child (<13 years).

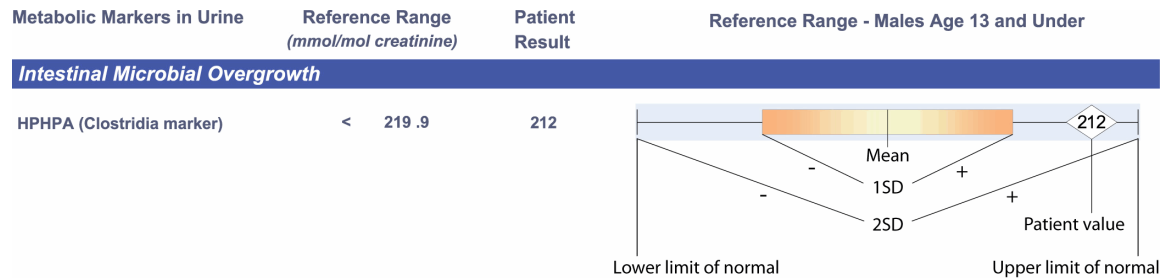
There are two types of graphical representations of patient values found in the new report format of both the standard Organic Acids Test and the Microbial Organic Acids Test.

The first graph will occur when the value of the patient is within the reference (normal) range, defined as the mean plus or minus two standard deviations.

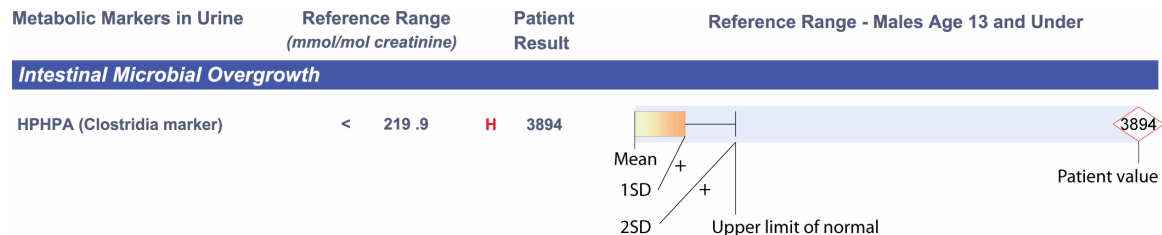
The second graph will occur when the value of the patient exceeds the upper limit of normal. In such cases, the graphical reference range is "shrunk" so that the degree of abnormality can be appreciated at a glance. In this case, the lower limits of normal are not shown, only the upper limit of normal is shown.

In both cases, the value of the patient is given to the left of the graph and is repeated on the graph inside a diamond. If the value is within the normal range, the diamond will be outlined in black. If the value is high or low, the diamond will be outlined in red.

Example of Value Within Reference Range



Example of Elevated Value



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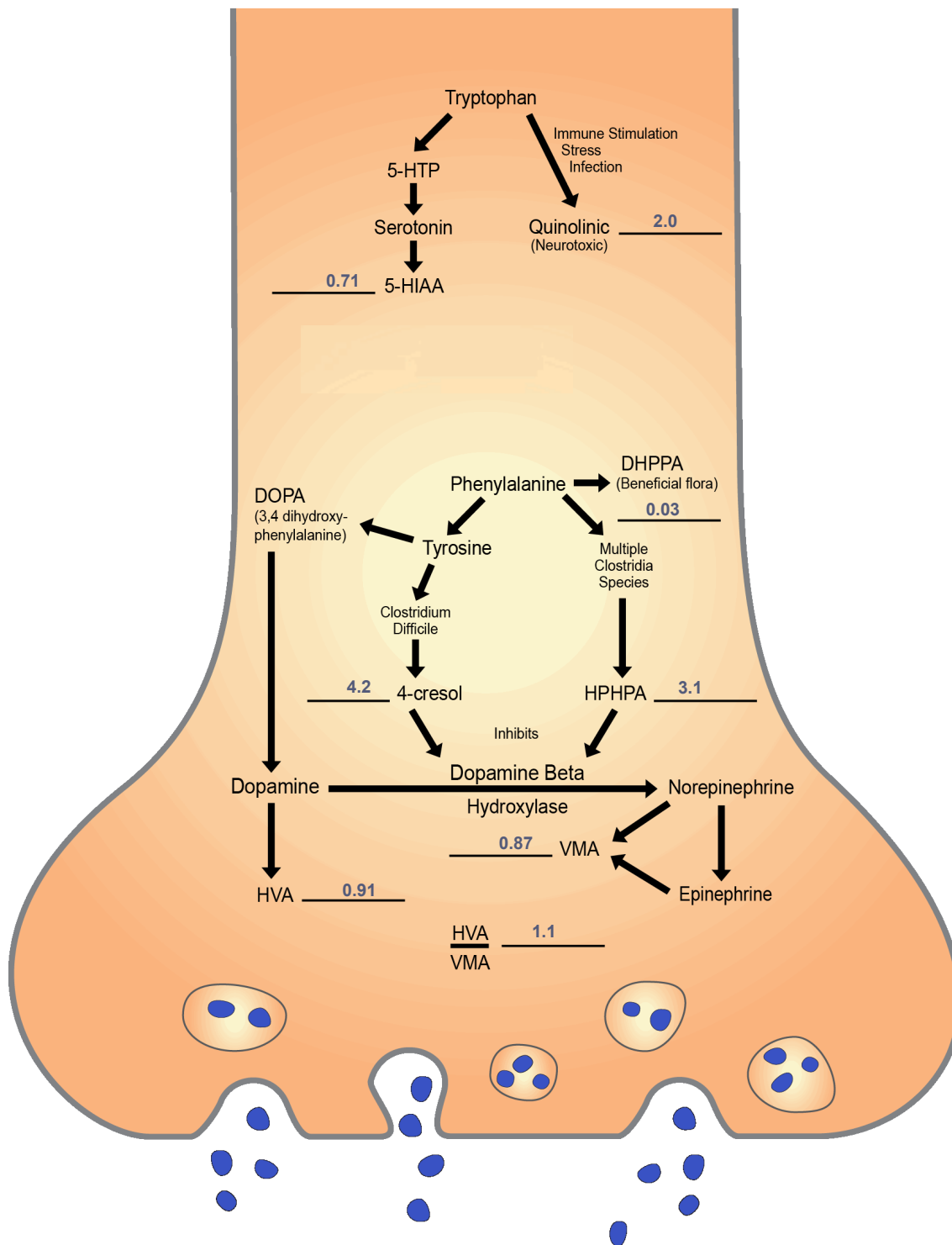
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Neurotransmitter Metabolism Markers



The diagram contains the patient's test results for neurotransmitter metabolites and shows their relationship with key biochemical pathways within the axon terminal of nerve cells. The effect of microbial byproducts on the blockage of the conversion of dopamine to norepinephrine is also indicated.

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Interpretation

Homovanillic acid (HVA) levels (33) below the mean indicate low production and/or decreased metabolism of the neurotransmitter dopamine. Homovanillic acid is a metabolite of the neurotransmitter dopamine. Low production of HVA can be due to decreased intake or absorption of dopamine's precursor amino acids such as phenylalanine and/or tyrosine, decreased quantities of cofactors needed for biosynthesis of dopamine such as tetrahydrobiopterin and vitamin B6 coenzyme or decreased amounts of cofactors such as S-adenosylmethionine (Sam-e) needed to convert dopamine to HVA. In addition, a number of genetic variations such as single nucleotide polymorphisms (SNPs) or mutations can cause reduced production of HVA due to enzymes with decreased function. HVA values below the mean but which are much higher than VMA values are usually due to impairment of dopamine beta hydroxylase due to excessive Clostridia metabolites, the mold metabolite fusaric acid, pharmaceuticals such as disulfiram, or food additives like aspartame or deficiencies of cofactors such as vitamin C or copper. Values may also be decreased in patients on monoamine oxidase (MAO) inhibitors. In addition, a number of genetic variations such as single nucleotide polymorphisms (SNPs) or mutations in MAO or COMT genes can cause reduced production of HVA. Such SNPs are available on **The Great Plains DNA methylation pathway test** which can be performed on a cheek swab.

Vanillylmandelic acid (VMA) levels (34) below the mean indicate low production and/or decreased metabolism of the neurotransmitters norepinephrine and epinephrine. Vanillylmandelic acid is a metabolite of the neurotransmitters norepinephrine and epinephrine. Low production of VMA can be due to decreased intake or absorption of norepinephrine's and epinephrine's precursor amino acids such as phenylalanine and/or tyrosine, decreased quantities of cofactors needed for biosynthesis of norepinephrine and epinephrine such as tetrahydrobiopterin and vitamin B6 coenzyme or decreased amounts of cofactors such as S-adenosylmethionine (Sam-e) needed to convert norepinephrine and epinephrine to VMA. In addition, a number of genetic variations such as single nucleotide polymorphisms (SNPs) or mutations in MAO or COMT genes can cause reduced production of VMA. Such SNPs are available on **The Great Plains DNA methylation pathway test** which can be performed on a cheek swab. VMA values below the mean but which are much lower than HVA values are usually due to impairment of dopamine beta hydroxylase due to Clostridia metabolites, the mold metabolite fusaric acid, pharmaceuticals such as disulfiram, or food additives like aspartame or deficiencies of cofactors such as vitamin C or copper. Values may be decreased in patients on monoamine oxidase (MAO) inhibitors. Another cause for a low VMA value is a genetic variation (single nucleotide polymorphism or SNP) of the DBH enzyme. Patients with low VMA due to Clostridia metabolites or genetic DBH deficiency should not be supplemented with phenylalanine, tyrosine, or L-DOPA.

5-hydroxyindoleacetic acid (5HIAA) (38) levels below the mean may indicate lower production and/or decreased metabolism of the neurotransmitter serotonin. 5-hydroxy-indoleacetic acid is a metabolite of serotonin. Low values have been correlated with symptoms of depression. Low production of 5HIAA can be due to decreased intake or absorption of serotonin's precursor amino acid tryptophan, decreased quantities of cofactors needed for biosynthesis of serotonin such as tetrahydrobiopterin and vitamin B6 coenzyme. In addition, a number of genetic variations such as single nucleotide polymorphisms (SNPs) or mutations can cause reduced production of 5HIAA. Such SNPs are available on **The Great Plains DNA methylation pathway test** which can be performed on a cheek swab. Values may be decreased in patients on monoamine oxidase (MAO) inhibitors that are drugs or foods that contain tyramine such as Chianti wine and vermouth, fermented foods such as cheeses, fish, bean curd, sausage, bologna, pepperoni, sauerkraut, and salami.

High uracil (41) can be associated with disorders of folate metabolism, folate deficiency, and genetic disorders of pyrimidine metabolism. Genetic disorders of pyrimidine metabolism are more common when uracil exceeds 50 mmol/mol creatinine and thymine is also elevated. An autistic child with a uracil value >300 mmol/mol creatinine and diffuse demyelination of the brain was treated with high levels of folate which normalized the uracil but did not improve the clinical symptoms.

Pyridoxic acid (B6) levels below the mean (51) may be associated with less than optimum health conditions (low intake, malabsorption, or dysbiosis). Supplementation with B6 or a multivitamin may be beneficial.

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Ascorbic acid (vitamin C) levels below the mean (54) may indicate a less than optimum level of the antioxidant vitamin C. Individuals who consume large amounts of vitamin C can still have low values if the sample is taken 12 or more hours after intake. Supplementation with buffered vitamin C taken 2 or 3 times a day is suggested.

Low citramalic, 2-hydroxyphenylacetic, 4-hydroxyphenylacetic, 4-hydroxybenzoic, 4-hydroxyhippuric, 3-indoleacetic, glyceric, glycolic, oxalic, lactic, pyruvic, 3-Methylglutaric, 3-methylglutaconic, 2-hydroxybutyric, fumaric, malic, aconitic, quinolinic, kynurenic, thymine, ethylmalonic, methylsuccinic, adipic, suberic, glutaric, 3-hydroxy-3-methylglutaric, methylcitric, or orotic values have no known clinical significance.