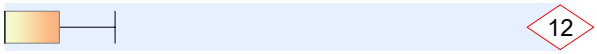
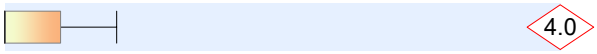
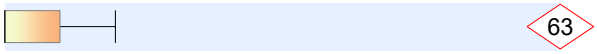
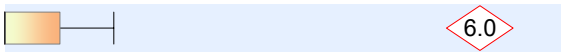
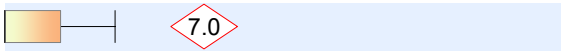
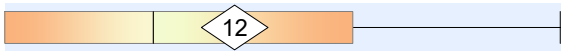
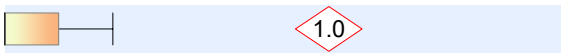
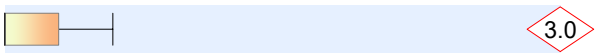
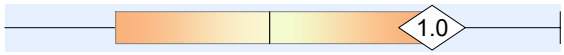
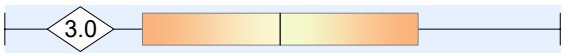
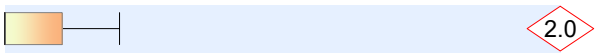
Microbial Organic Acids TEST

REQUISITION #	9900008	COLLECTION TIME	06:30 AM
PATIENT NAME	Report Sample	COLLECTION DATE	Apr 5, 2025
DATE OF BIRTH	Mar 9, 1960	SAMPLE TYPE	Urine
GENDER F	AGE 65	REPORT DATE	Nov 21, 2025
PRACTITIONER	NO PHYSICIAN		

INTESTINAL MICROBIAL OVERGROWTH

	METABOLITE	REFERENCE RANGE		RESULTS (mmol/mol creatinine)	REFERENCE POPULATION Females Age 13 and Over
YEAST AND FUNGAL					
1	Citramalic	≤ 3.6	H	12	
2	5-Hydroxymethyl-2-furoic *(Aspergillus)*	≤ 14		2.0	
3	3-Oxoglutaric	≤ 0.33	H	4.0	
4	Furan-2,5-dicarboxylic *(Aspergillus)*	≤ 16	H	63	
5	Furancarbonylglycine *(Aspergillus)*	≤ 1.9	H	6.0	
6	Tartaric *(Aspergillus)*	≤ 4.5	H	7.0	
7	Arabinose	≤ 29		8.0	
8	Carboxycitric	≤ 29		12	
9	Tricarballylic *(Fusarium)*	≤ 0.44	H	1.0	
BACTERIAL					
10	Hippuric	≤ 613		9.0	
11	2-Hydroxyphenylacetic	0.06 - 0.66	H	3.0	
12	4-Hydroxybenzoic	≤ 1.3		1.0	
13	4-Hydroxyhippuric	0.79 - 17		3.0	
14	DHPPA *(Beneficial Bacteria)*	≤ 0.38	H	2.0	

MOSAIC DIAGNOSTICS
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Sean Agger PhD, MS, MBA, DABCC, DABMM, Lab Director | CLIA 17D0919496 | Report Design © 2025 MosaicDX

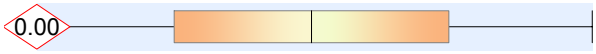
METABOLITE	REFERENCE RANGE	RESULTS (mmol/mol creatinine)	REFERENCE POPULATION Females Age 13 and Over

INTESTINAL MICROBIAL OVERGROWTH

CLOSTRIDIA BACTERIAL

15	**4-Hydroxyphenylacetic** *(C. difficile, C. stricklandii & others)*	≤ 19	**5.0**	
16	**HPHPA** *(C. sporogenes, C. botulinum & others)*	≤ 208	**10**	
17	**4-Cresol** *(C. difficile)*	≤ 75	**6.0**	
18	**3-Indoleacetic** *(C. stricklandii, C. subterminale & others)*	≤ 11	**11**	

ADDITIONAL INDICATORS

19	**3-Hydroxy-3-methylglutaric**	0.17 - 39	L	**0**	
20	**2-Hydroxyhippuric**	≤ 1.3		**1.0**	

INDICATOR OF FLUID INTAKE

21	**Creatinine**	**100**	**mg/dL**

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 + 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 in the report format of both the standard Organic Acids Test and the Microbial Organic Acids Test.

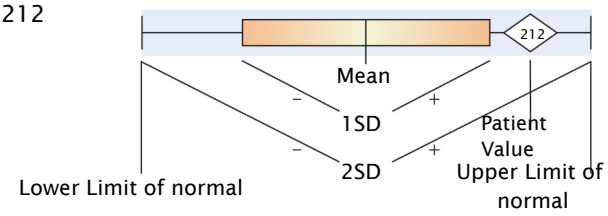
The first graph will occur when the value of the patient is within the reference (normal) range, defined as the mean plus or minus two standard deviations.

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.

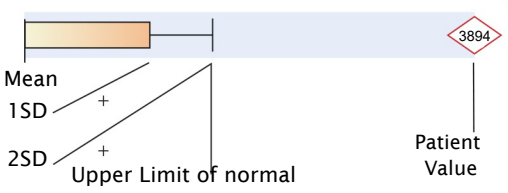
EXAMPLE OF VALUE WITHIN REFERENCE RANGE

METABOLITE	REFERENCE RANGE	RESULTS (mmol/mol creatinine)	REFERENCE POPULATION Males Under Age 13
INTESTINAL MICROBIAL OVERGROWTH			
(16) **HPHPA** *(C. sporogenes, C. botulinum & others)*	≤ 219.9	212	



EXAMPLE OF ELEVATED VALUE

METABOLITE	REFERENCE RANGE	RESULTS (mmol/mol creatinine)	REFERENCE POPULATION Males Under Age 13
INTESTINAL MICROBIAL OVERGROWTH			
(16) **HPHPA** *(C. sporogenes, C. botulinum & others)*	≤ 219.9	H 3894	



Methodology: GC-MS.Creatinine by Jaffe Reaction. The creatinine test is performed to adjust metabolic marker results for differences in fluid intake. Urinary creatinine, from a random collection, has limited diagnostic value due to variability as a result of recent fluid intake.

For more extensive interpretations, refer to the support guide.

1 Citramalic

Citramalic acid, produced by microorganisms such as *Aspergillus niger* and some bacteria, can be a marker of dysbiosis and fungal overgrowth, and may be linked to mold exposure. Elevated levels may impair energy production by disrupting the Krebs cycle and are influenced by dietary intake of foods such as apples, tomatoes, and wine.

3 3-Oxoglutaric

3-Oxoglutaric acid, is a short-chain keto acid and a simple carboxylic acid. It is a microbial metabolite of yeast and is also an analog of 2-oxoglutarate (also known as alpha-ketoglutaric acid) from the Krebs cycle, playing a potential role in mitochondrial health.

4 Furan-2,5-dicarboxylic

Furan-2,5-dicarboxylic acid (FDCA) is a dicarboxylic acid produced from hydroxymethylfurfural (HMF). Various microorganisms, including molds such as *Aspergillus* and *Penicillium*, can metabolize HMF into FDCA. FDCA can be generated by certain foods and beverages, and is also a byproduct of polyethylene furanoate (PEF) polymer found in plastics.

5 Furancarbonylglycine

Furancarbonylglycine, also known as 2-furoylglycine, is a furan-derived acyl glycine that may be linked to the fungus *Aspergillus*, serving as a marker for mold exposure or overgrowth. Additionally, dietary intake of high-temperature processed foods and beverages, such as coffee, can influence its levels.

6 Tartaric

Tartaric acid is a naturally occurring dicarboxylic acid associated with the activity of *Aspergillus*, *Penicillium*, and to a lesser extent, *Candida* and *Saccharomyces*. Elevated levels may indicate fungal dysbiosis. It can also inhibit the Krebs cycle by disrupting malic acid utilization, potentially impacting mitochondrial function. Additionally, dietary sources such as grapes, red wine, tamarind, and certain food additives may contribute to elevated levels.

9 Tricarballylic

Tricarballylic acid is often associated with the fumonisin class of mycotoxins produced mainly by various *Fusarium* species and *Aspergillus nigri* (black aspergilli). These mold exposures can come from indoor environments and contaminated dietary sources such as numerous grain products. This metabolite may also be produced from certain bacteria. Tricarballylic acid has been shown to bind to various minerals, influencing nutritional needs.

10 Hippuric

Hippuric acid is a conjugate of glycine and benzoic acid, and may be influenced by gut bacteria, diet, and environmental exposures. It can be produced during the breakdown of benzene-type aromatic compounds from either microbial activity in the gut, exposure to toluene, or naturally produced in the liver from dietary intake of polyphenol-rich foods. Low levels can indicate poor microbial activity, glycine or B5 insufficiencies, and has also been associated with numerous chronic conditions. In rare cases, extreme elevations may be linked to genetic metabolic disorders.

11 2-Hydroxyphenylacetic

2-Hydroxyphenylacetic acid is a metabolite of phenylalanine and plays a role in microbial and metabolic processes. It is associated with microbial activity in the gut, phenylalanine utilization for neurotransmitter production, and certain genetic and dietary influences.

13 4-Hydroxyhippuric

4-Hydroxyhippuric acid is a urinary metabolite formed by the conjugation of glycine with 4-hydroxybenzoic acid, a compound produced from microbial metabolism of dietary polyphenols, amino acids, or parabens. Elevated levels may stem from gastrointestinal bacterial overgrowth, high intake of polyphenol-rich foods, or paraben exposure from personal care products, pharmaceuticals, and packaged foods. In the case of a low value, and if 4-hydroxybenzoic acid is elevated, and 4-hydroxyhippuric acid is low, it could be an indication of glycine insufficiency.

14 DHPPA

3,4-Dihydroxyphenylpropionic acid (DHPPA), also known as dihydrocaffeic acid, is a metabolite produced by gut microbiota through the breakdown of certain dietary polyphenols. DHPPA is primarily associated with *Lactobacilli*, *Bifidobacteria*, *E. coli*, and some *Clostridium* species often identified as commensal. Elevated levels may indicate a polyphenol-rich diet or an abundance of these flora, while low levels suggest insufficient polyphenols or potentially reduced beneficial bacteria.

Microbial Organic Acids
TEST

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