Total Wellness
Empowerment
Institute

Total Wellness
Empowerment
Institute

Practitioner Lab Introduction Training

WELCOME

About the Founder

- Nancy Guberti, MS, CN, Functional Medicine Specialist
- IMMH Practitioner (Integrative Medicine Mental Health)
- Practitioner Speaker Educator for Desert Biological
- Speaker for Desbio/Trinity School of Natural Health certified class
- GFCF Diet Counselor
- Author, Healthy Living Everyday, Total Wellness for Mind and Body
- 21+ years private practice in Greenwich CT
- Utilizing functional medicine lab testing, creating customized supplement and food regimes
- Autism Expert Practitioner Training Program
- Total Wellness Empowerment Monthly Mentorship
- Total Wellness Empowerment Mentorship
- Look & Feel Great Method: 9 to Steps Healthy Living based on clinical research
- Total Wellness Empowerment Podcast

Organic Acid Testing

- This test detects the organic acids in urine that are byproducts of daily cellular metabolism. The panel can accurately identify conditions associated with genetic disorders, nutrient deficiencies, intestinal dysbiosis, and toxicity from diet and prescription drugs.
- The Organic Acids panel is designed to take a broad look at multiple systems and get a snapshot of how the body is functioning.

Total Wellness Empowerment Institute

Practitioner Lab Introduction Training

Why Is This Test Important?

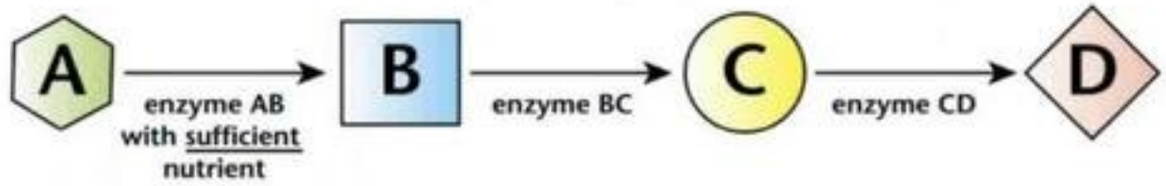
- Chronic inflammatory diseases are the most significant cause of death in the world. The World Health Organization (WHO) ranks chronic diseases as the greatest threat to human health
-
- Based on known metabolic pathways and enzyme-cofactor requirements, organic acid markers can provide great insights into the underlying causes of chronic symptoms.
-
- Organic acids testing can help detect metabolism imbalances, infection risk, impaired detoxification, nutrient deficiencies, toxicity, and inflammation in those with chronic or complex acute illness.
-
- Alongside other diagnostic testing, organic acids profiles provide a comprehensive view of root causes and enable your healthcare provider to develop a personalized and effective treatment plan for your chronic condition.

Why Is This Test Important?

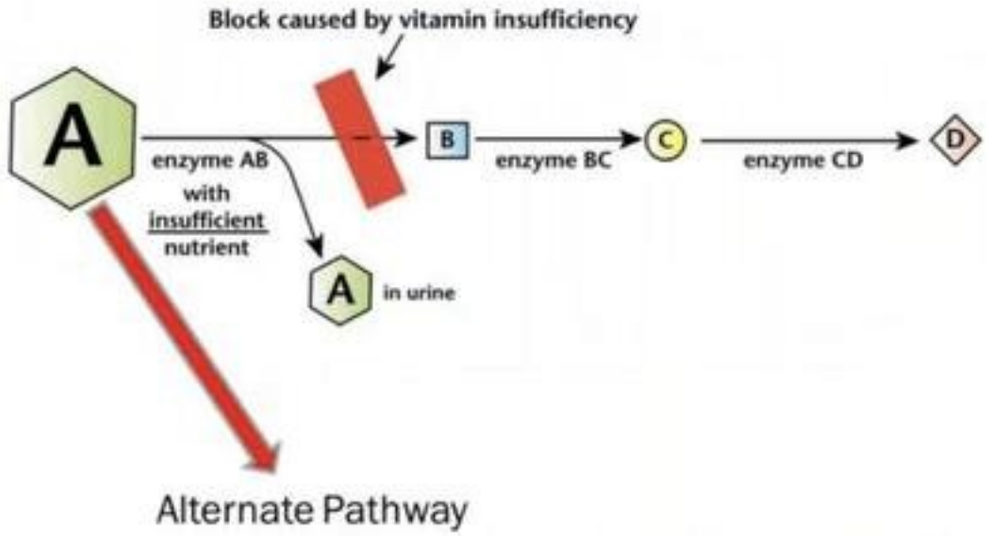
- Chronic inflammatory diseases are the most significant cause of death in the world. The World Health Organization (WHO) ranks chronic diseases as the greatest threat to human health
-
- Based on known metabolic pathways and enzyme-cofactor requirements, organic acid markers can provide great insights into the underlying causes of chronic symptoms.
-
- Organic acids testing can help detect metabolism imbalances, infection risk, impaired detoxification, nutrient deficiencies, toxicity, and inflammation in those with chronic or complex acute illness.
-
- Alongside other diagnostic testing, organic acids profiles provide a comprehensive view of root causes and enable your healthcare provider to develop a personalized and effective treatment plan for your chronic condition.

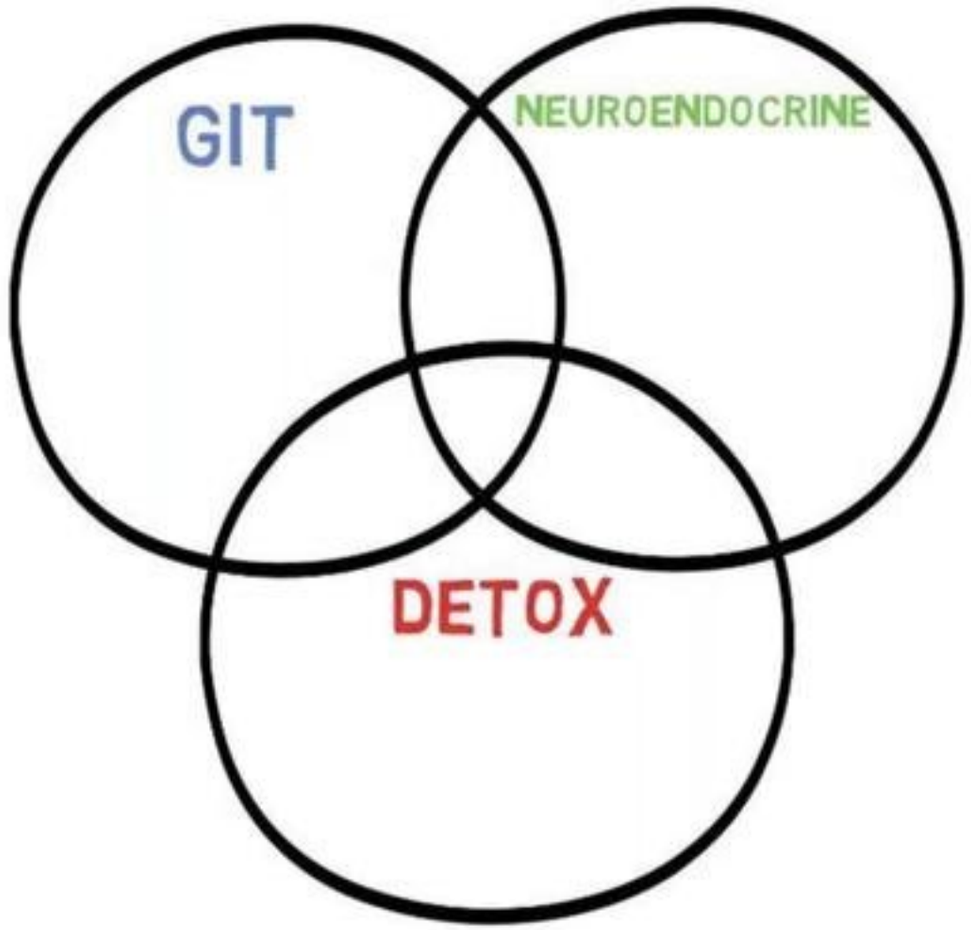
WHAT IS AN ORGANIC ACID?

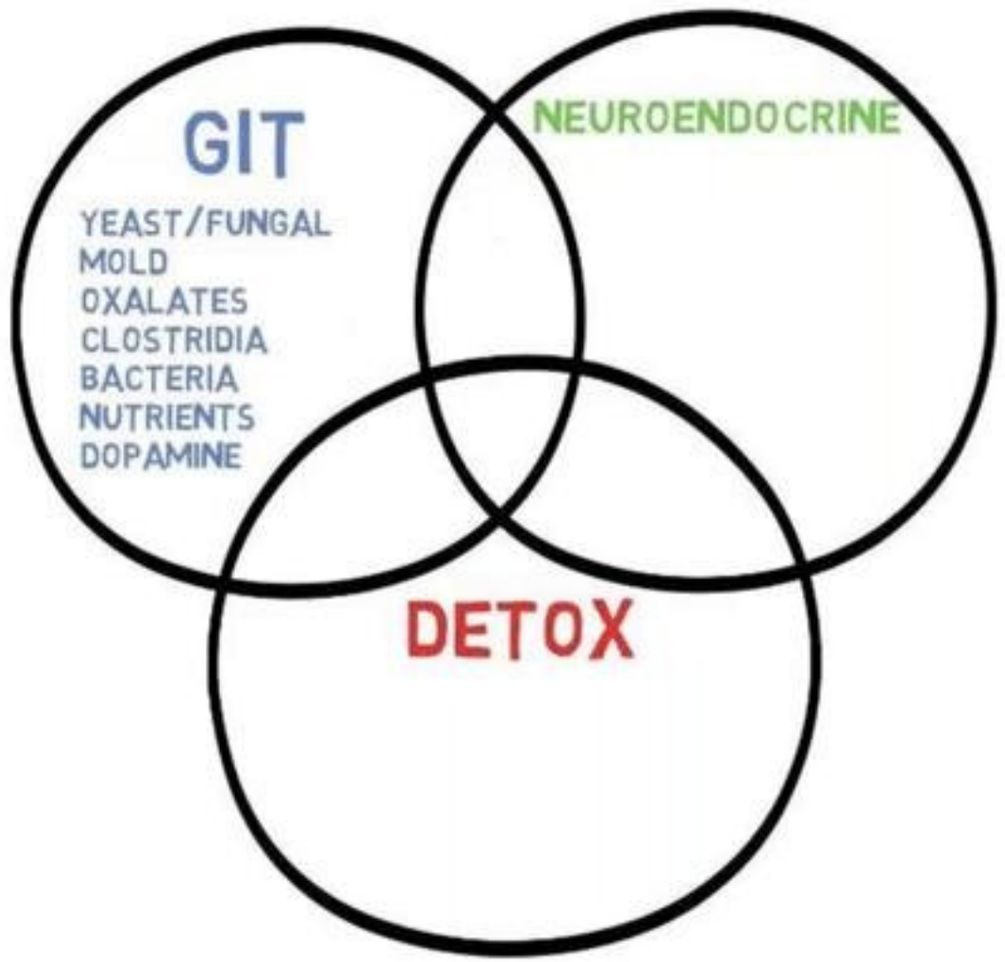
1



2




GIT
NEUROENDOCRINE
DETOX


GIT
YEAST/FUNGAL
MOLD
OXALATES
CLOSTRIDIA
BACTERIA
NUTRIENTS
DOPAMINE
NEUROENDOCRINE
DETOX

YEAST/FUNGAL markers

	Yeast and Fungal Markers				
1	Citramalic	≤ 5.0		0.80	
2	5-Hydroxymethyl-2-furoic	≤ 28	H	75	
3	3-Oxoglutaric	≤ 0.46		0.05	
4	Furan-2,5-dicarboxylic	≤ 18	H	89	
5	Furancarbonylglycine	≤ 3.1		0.69	
6	Tartaric	≤ 6.5		1.7	
7	Arabinose	≤ 50	H	93	
8	Carboxycitric	≤ 25		0.04	
9	Tricarballylic	≤ 1.3		0.27	

Arabinose is the most common candida marker. This is a sign of connective tissue break down. Consider individual reactions based on sensitivities and genetic SNPs.

Tartaric acid the second most common candida marker.

	Vitamin B2 (Riboflavin)				
53	Glutaric ●	0.04 - 0.36	H	0.52	

Mold Markers

Yeast and Fungal Markers

1	Citramalic	≤	5.0		0.80	0.80
2	5-Hydroxymethyl-2-furoic	≤	28	H	75	75
3	3-Oxoglutaric	≤	0.46		0.05	0.05
4	Furan-2,5-dicarboxylic	≤	18	H	89	89
5	Furancarbonylglycine	≤	3.1		0.69	0.69
6	Tartaric	≤	6.5		1.7	1.7
7	Arabinose	≤	50	H	93	93
8	Carboxycitric	≤	25		0.04	0.0
9	Tricarballylic	≤	1.3		0.27	0.27

Associated with aspergillus and/or penicillium mould. Most common exposures are mouldy food – fruits, grains, cheese, old nuts and peanuts, tomato pastes/sauces

Absence of markers DOES NOT exclude Mold Biotoxins or CIRS

OXALATE markers

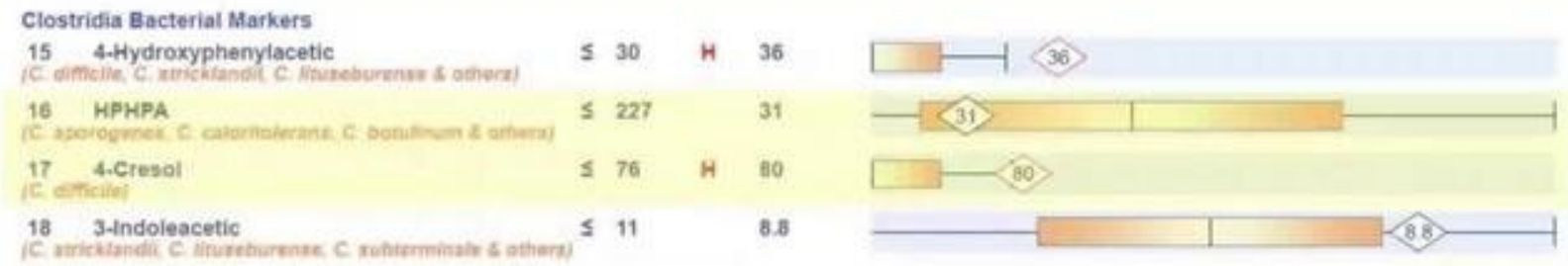
Oxalate Metabolites						
19	Glyceric	0.74	- 13		3.1	
20	Glycolic	27	- 221		80	
21	Oxalic	35	- 185	H	262	

Oxalic acid is the most common and comes up 90% of the time. Usually related to diet and/or yeast overgrowth.

Glyceric and Glycolic acid is more suggestive of endogenous oxalate production or genetic involvement. May indicate the need for B6 supplementation.

Vitamin B6					
51	Pyridoxic (B6)	≤	53	2.4	

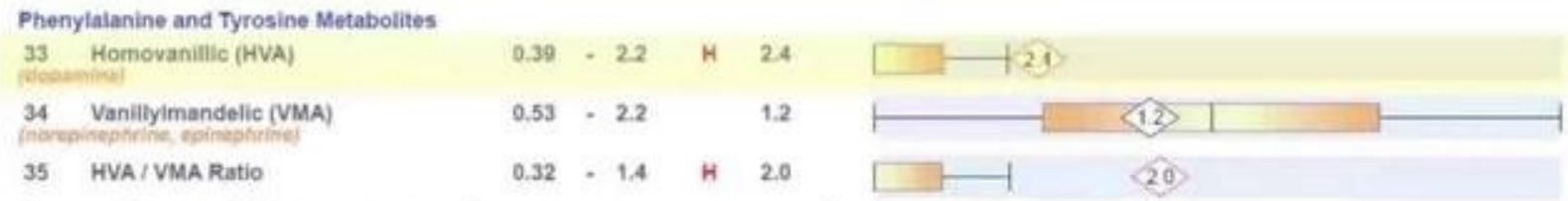
CLOSTRIDIA markers



Both HPHPA and 4-cresol have a 6-hydrocarbon benzene ring.

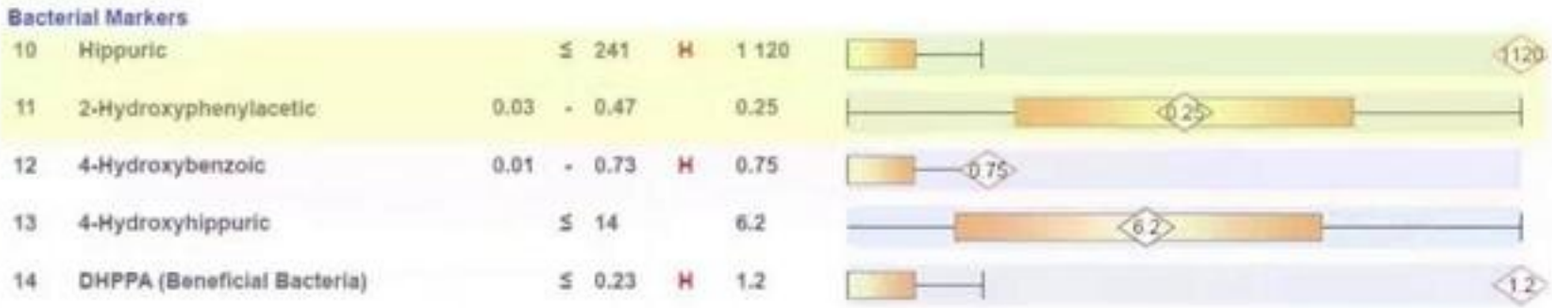
HPHPA has 3 groups attached to its benzene ring – hydroxyl, phenyl and propionic acid group. It tests high more often than 4-cresol.

4-cresol has 2 groups attached to its benzene ring – hydroxyl and methyl group. C. difficile is among only a few bacteria able to ferment tyrosine to 4-cresol.



Clostridia inhibits DBH so less DA is converted to NE = irreversible

BACTERIAL markers

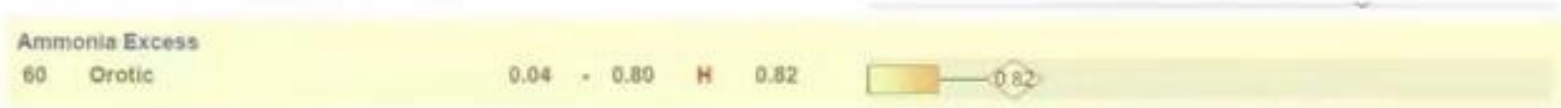


Bacterial Markers							
10	Hippuric		≤ 241	H	1 120	120
11	2-Hydroxyphenylacetic	0.03	- 0.47		0.25	0.25
12	4-Hydroxybenzoic	0.01	- 0.73	H	0.75	0.75
13	4-Hydroxyhippuric		≤ 14		6.2	6.2
14	DHPPA (Beneficial Bacteria)		≤ 0.23	H	1.2	1.2

Hippuric acid is the most common marker with gut bacterial overgrowth such as Streptococcus.

Hippuric acid = Glycine + Benzoic acid

2-Hydroxyphenylacetic acid may be an indication for SIBO. Also becomes elevated with Giardia.



Ammonia Excess						
60	Orotic	0.04	- 0.80	H	0.82	0.82

Ammonia is a by-product from certain bacteria, parasites and H. pylori.

TREATMENT and TESTING

Treatment Considerations	Further Testing
Fix leaky gut Dietary changes Improve nutrient absorption Reduce inflammation Consider adequate protein intake	CSA (stool) FMA (stool) Parasitology (stool) SIBO (breath) Gluten markers Food sensitivity


GIT
YEAST/FUNGAL
MOLD
OXALATES
CLOSTRIDIA
BACTERIA
NUTRIENTS
DOPAMINE
NEUROENDOCRINE
GLYCOLYSIS
MITO
KETONES
NEUROTRANSMITTERS
NUTRIENTS
DETOX

CARBOHYDRATE markers

Glycolytic Cycle Metabolites

22	Lactic	0.18	- 44	H	49	
23	Pyruvic	0.88	- 9.1	L	0.85	

Look at the ratio between lactic acid and pyruvate.

Nutrients get stuck in glycolysis if it cannot enter the mitochondria and citric acid cycle.

So they become sugar burners

When glucose runs out, they start breaking down muscle via gluconeogenesis.

High lactic acid levels are seen about 15% of the time when oxalates are high and contribute to symptoms of fibromyalgia.

MITOCHONDRIAL markers

Mitochondrial Markers - Krebs Cycle Metabolites

24	Succinic		≤ 23	H	43	43
25	Fumaric		≤ 1.8		0.02	0.02
26	Malic		≤ 2.3		1.8	1.8
27	2-Oxoglutaric		≤ 96		5.1	5.1
28	Aconitic	9.8	- 39		11	11
29	Citric		≤ 597		388	388

Succinic and citric acid are the two most common markers that show up high. Yeast?

Aconitic acid the most common marker that will show up low. Relevance?

Vitamin B12

50	Methylmalonic ●		≤ 2.3	H	2.7	2.7

Vitamin Q10 (CoQ10)

55	3-Hydroxy-3-methylglutaric ●		≤ 26		13	13

FAT METABOLISM markers

Ketone and Fatty Acid Oxidation

42	3-Hydroxybutyric		≤ 1.9		1.7	1.7
43	Acetoacetic		≤ 10		0	0.00
44	4-Hydroxybutyric		≤ 4.3		1.5	1.5
45	Ethylmalonic	0.13	- 2.7		0.87	0.87
46	Methylsuccinic		≤ 2.3		0.91	0.9
47	Adipic		≤ 2.9	H	6.5	6.5
48	Suberic		≤ 1.9	H	21	21
49	Sebacic		≤ 0.14	H	7.0	7.0

In general ketone markers are indicators of... Oxidative Stress

BHBA and Acetoacetate indicates fat adaptability or the ability to use fatty acids as a fuel source.

FAT METABOLISM markers

Ketone and Fatty Acid Oxidation

42	3-Hydroxybutyric		≤ 1.9		1.7	1.7
43	Acetoacetic		≤ 10		0	0.0
44	4-Hydroxybutyric		≤ 4.3		1.5	1.5
45	Ethylmalonic	0.13	- 2.7		0.87	0.87
46	Methylsuccinic		≤ 2.3		0.91	0.9
47	Adipic		≤ 2.9	H	6.5	6.5
48	Suberic		≤ 1.9	H	21	21
49	Sebacic		≤ 0.14	H	7.0	7.0

Suberic acid is the most common ketone marker that shows up high = overnight fast

Adipic acid as a stand-alone marker = gelatin

When carnitine is deficient these ketone markers will spill into the urine instead of entering the Citric Acid Cycle.

NEUROTRANSMITTER markers

Neurotransmitter Metabolites					
Phenylalanine and Tyrosine Metabolites					
33 Homovanillic (HVA) *(dopamine)*	0.39	- 2.2		2.0	
34 Vanillylmandelic (VMA) *(norepinephrine, epinephrine)*	0.53	- 2.2		1.5	
35 HVA / VMA Ratio	0.32	- 1.4		1.4	
Tryptophan Metabolites					
36 5-Hydroxyindoleacetic (5-HIAA) *(serotonin)*		≤ 2.9		0.49	
37 Quinolinic	0.52	- 2.4	H	3.8	
38 Kynurenic	0.12	- 1.8		1.1	
39 Quinolinic / 5-HIAA Ratio		≤ 2.5	H	7.8	

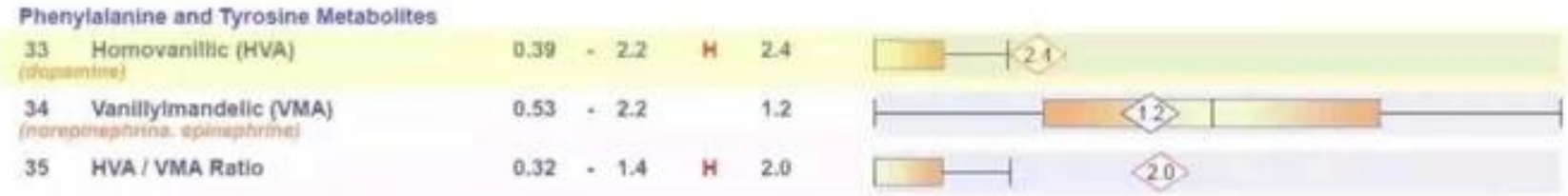
EXCITATORY

INHIBITORY

INFLAMMATORY

- Anxiety
- Depression
- Irritability
- Sleep disorders

NEUROTRANSMITTER markers



Phenylalanine and Tyrosine Metabolites

33	Homovanillic (HVA) (dopamine)	0.39	- 2.2	H	2.4	2.4
34	Vanillylmandelic (VMA) (norepinephrine, epinephrine)	0.53	- 2.2		1.2	1.2
35	HVA / VMA Ratio	0.32	- 1.4	H	2.0	2.0

HVA often seen elevated in autism, behavioural abnormalities and anxiety.

HVA also becomes elevated due to stress-induced catecholamine output from the adrenal gland which can deplete vitamin C.

Vitamin C

54	Ascorbic	10	- 200	L	0.34	0.34

VMA (NE and Epi) is associated with energy, alertness, concentration and socialization – ADHD, OCD, depression.

Higher DA to NE = decreased conversion via DBH – Clostridia? Co-factors?

ANS Sympathetic activation

NEUROTRANSMITTER markers

Neurotransmitter Metabolites

Phenylalanine and Tyrosine Metabolites						
33	Homovanillic (HVA)	0.39	- 2.2		2.0	2.0
34	Vanillylmandelic (VMA)	0.53	- 2.2		1.5	1.5
35	HVA / VMA Ratio	0.32	- 1.4		1.4	1.4
Tryptophan Metabolites						
36	5-Hydroxyindoleacetic (5-HIAA)		≤ 2.9		0.49	0.5
37	Quinolinic	0.52	- 2.4	H	3.8	3.8
38	Kynurenic	0.12	- 1.8		1.1	1.1
39	Quinolinic / 5-HIAA Ratio		≤ 2.5	H	7.8	7.8

5-HIAA is low or low-normal 90% of the time – chronic disorder testing population.

AANAT is one of the enzymes that converts serotonin into melatonin. It uses pantothenic acid (vitamin B5) as a co-factor.

Vitamin B5					
52	Pantothenic (B5)	≤ 26		4.0	4.0

NEUROTRANSMITTER markers

Neurotransmitter Metabolites

Phenylalanine and Tyrosine Metabolites						
33	Homovanillic (HVA) *(dopamine)*	0.39	- 2.2		2.0	2.0
34	Vanillylmandelic (VMA) *(norepinephrine, epinephrine)*	0.53	- 2.2		1.5	1.5
35	HVA / VMA Ratio	0.32	- 1.4		1.4	1.4
Tryptophan Metabolites						
36	5-Hydroxyindoleacetic (5-HIAA) *(serotonin)*		≤ 2.9		0.49	0.49
37	Quinolinic	0.52	- 2.4	H	3.8	3.8
38	Kynurenic	0.12	- 1.8		1.1	1.1
39	Quinolinic / 5-HIAA Ratio		≤ 2.5	H	7.8	7.6

QA is not often elevated, maybe 10% of the time.

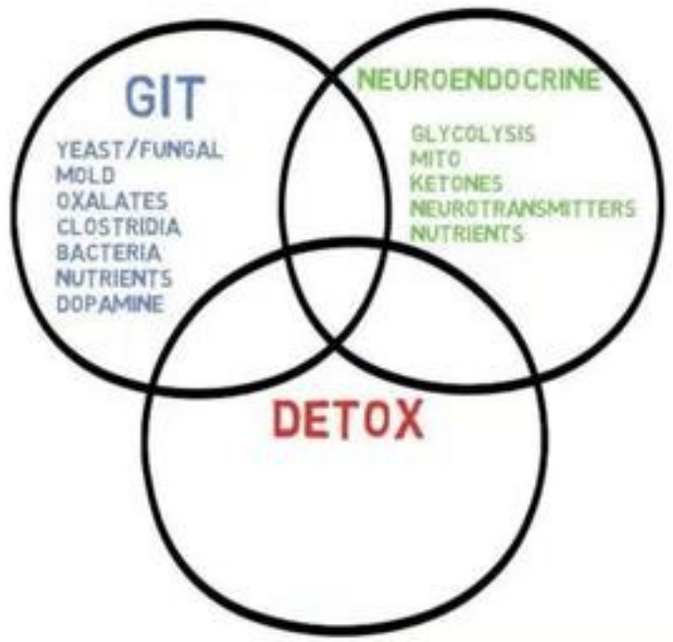
Inflammation **Neural excitotoxicity** **Mitochondrial support**

Kynurenine protects the brain against pathogens and needs vitamin B6 as a co-factor.

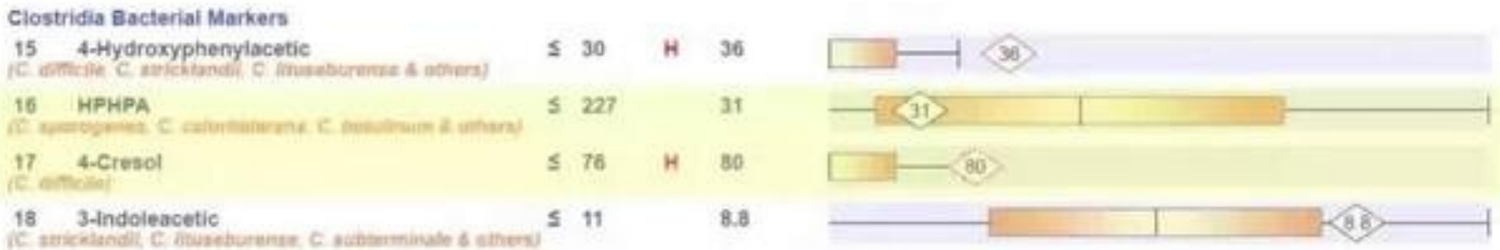
Vitamin B6					
51	Pyridoxic (B6)		≤ 53		2.4

TREATMENT and TESTING

Treatment Considerations	Further Testing
Dietary changes Exercise habits Breathing and Oxygen Stress and Sleep habits Reduce neural inflammation Thyroid function Support mitochondria	Cortisol (saliva, urine) DHEA and steroidal/sex hormones Neurotransmitters (urine) Thyroid testing Cholesterol, blood sugar, HbA1c Gene SNPs


GIT
YEAST/FUNGAL
MOLD
OXALATES
CLOSTRIDIA
BACTERIA
NUTRIENTS
DOPAMINE
NEUROENDOCRINE
GLYCOLYSIS
MITO
KETONES
NEUROTRANSMITTERS
NUTRIENTS
DETOX

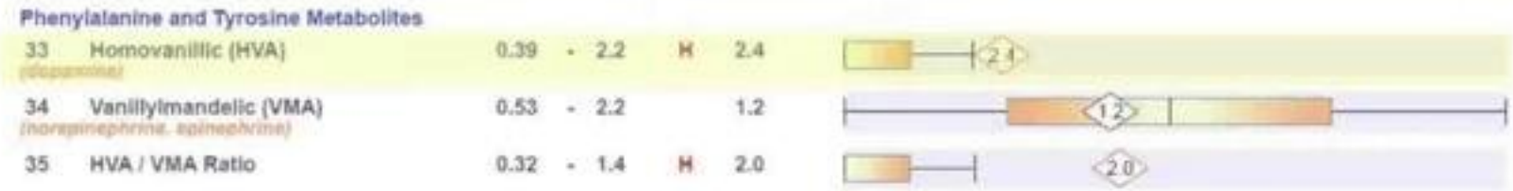
CLOSTRIDIA markers



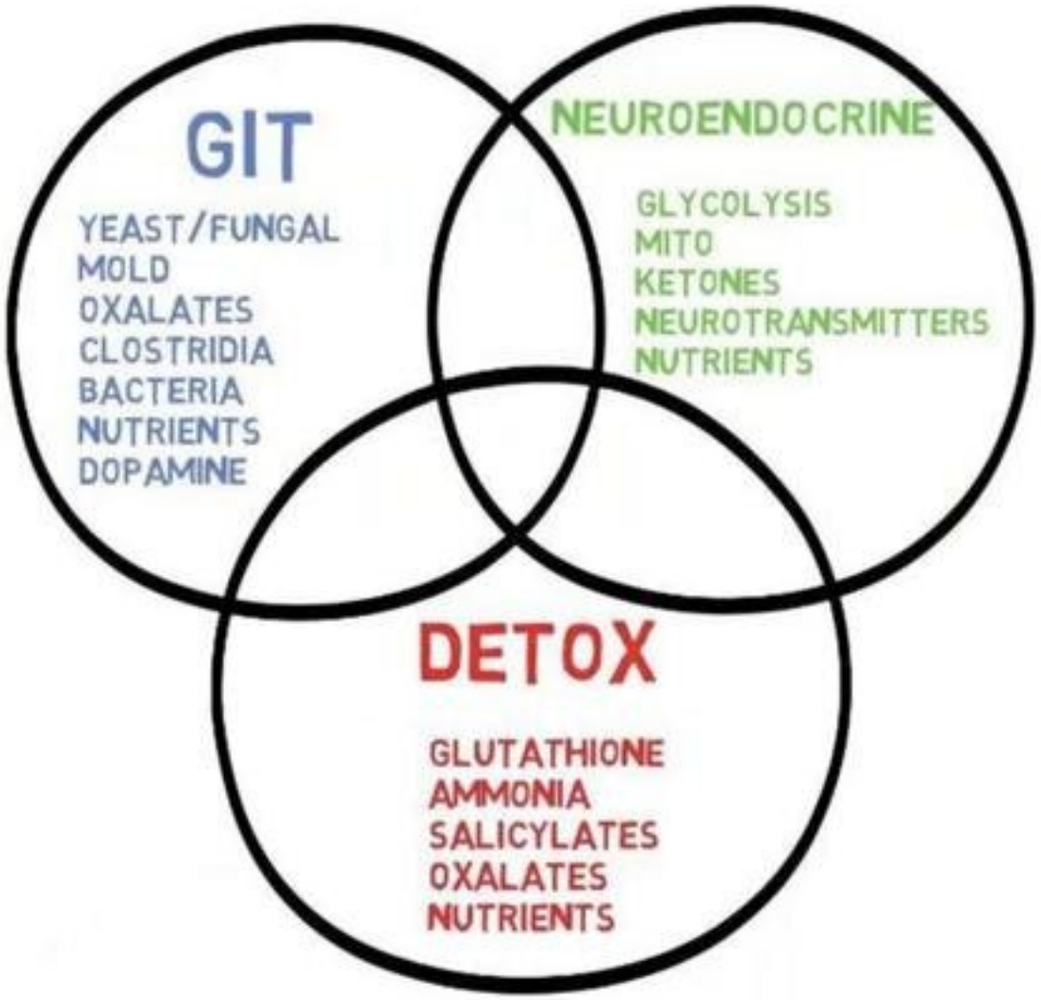
Both HPHPA and 4-cresol have a 6-hydrocarbon benzene ring.

HPHPA has 3 groups attached to its benzene ring – hydroxyl, phenyl and propionic acid group. It tests high more often than 4-cresol.

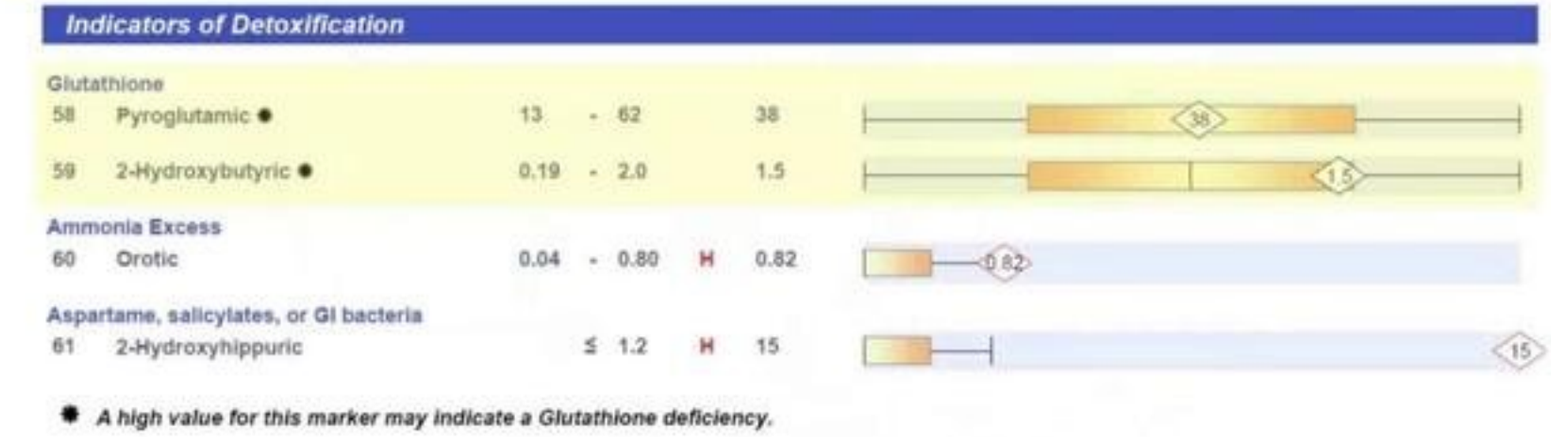
4-cresol has 2 groups attached to its benzene ring – hydroxyl and methyl group. C. difficile is among only a few bacteria able to ferment tyrosine to 4-cresol.



Clostridia inhibits DBH so less DA is converted to NE = irreversible


GIT
YEAST/FUNGAL
MOLD
OXALATES
CLOSTRIDIA
BACTERIA
NUTRIENTS
DOPAMINE
NEUROENDOCRINE
GLYCOLYSIS
MITO
KETONES
NEUROTRANSMITTERS
NUTRIENTS
DETOX
GLUTATHIONE
AMMONIA
SALICYLATES
OXALATES
NUTRIENTS

GLUTATHIONE markers



Indicators of Detoxification

Glutathione						
58	Pyroglutamic ●	13	- 62		38	
59	2-Hydroxybutyric ●	0.19	- 2.0		1.5	
Ammonia Excess						
60	Orotic	0.04	- 0.80	H	0.82	
Aspartame, salicylates, or GI bacteria						
61	2-Hydroxyhippuric		≤ 1.2	H	15	

38 1.5 0.82 15

● *A high value for this marker may indicate a Glutathione deficiency.*

Pyroglutamic acid shows up more often than 2-hydroxybutyric acid.

= Glutathione Deficiency

2-Hydroxybutyric acid is a marker of hepatic glutathione synthesis rate and is a by-product produced when cystathionine is converted to cysteine.

= CBS upregulation

GLUTATHIONE co-factors

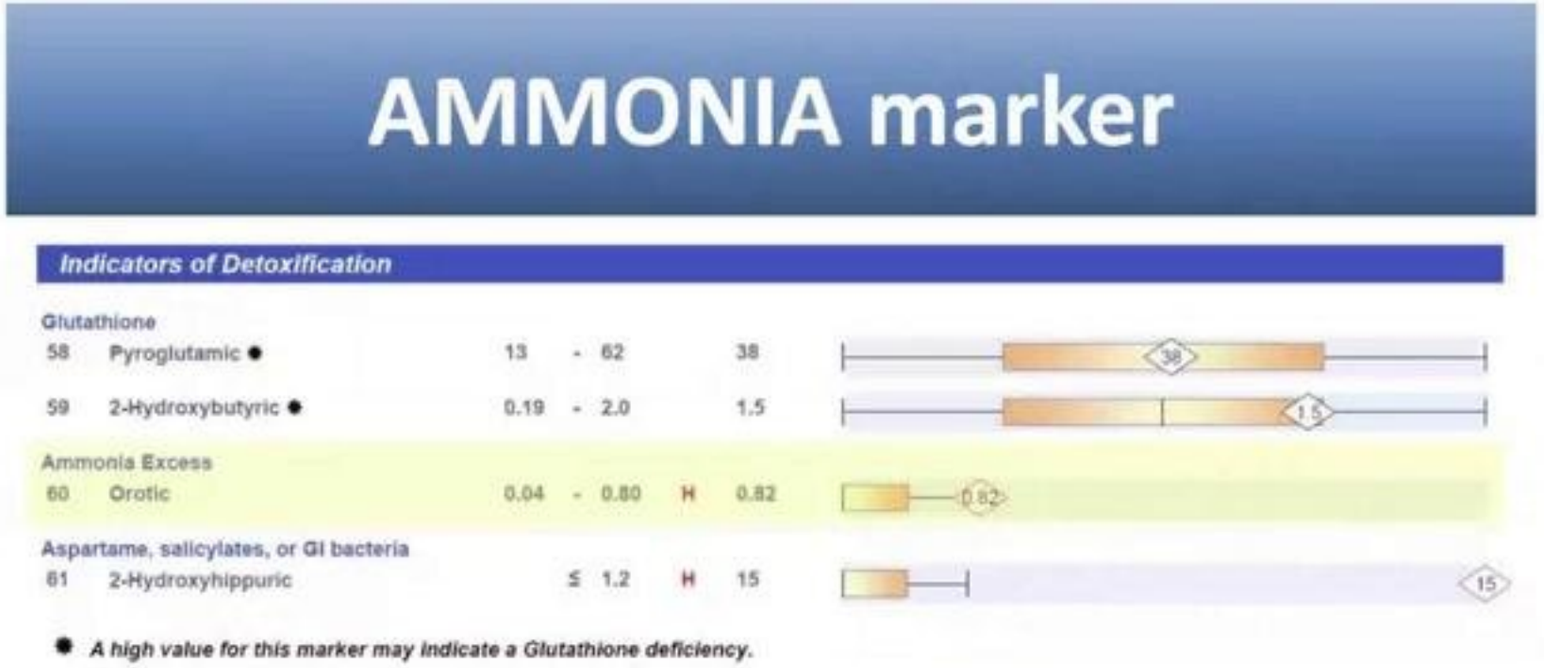
Vitamin B6						
51	Pyridoxic (B6)		≤ 59		9.3	
Vitamin B5						
52	Pantothenic (B5)		≤ 26		9.1	
Vitamin B2 (Riboflavin)						
53	Glutaric ●		≤ 1.1		0.78	
Vitamin C						
54	Ascorbic	10	- 200	L	0.98	
Vitamin Q10 (CoQ10)						
55	3-Hydroxy-3-methylglutaric ●		≤ 101		41	
Glutathione Precursor and Chelating Agent						
56	N-Acetylcysteine (NAC)		≤ 0.41		0	

NAC is the rate-limiting amino acid involved in glutathione production.

Vitamin C is needed to get glutathione back into its reduced state.

Vitamin B6 is the co-factor for the CBS enzyme.

AMMONIA marker



Indicators of Detoxification

Glutathione						
58	Pyroglutamic ●	13	- 62		38	38
59	2-Hydroxybutyric ●	0.19	- 2.0		1.5	1.5
Ammonia Excess						
60	Orotic	0.04	- 0.80	H	0.82	0.82
Aspartame, salicylates, or GI bacteria						
61	2-Hydroxyhippuric		≤ 1.2	H	15	15

● *A high value for this marker may indicate a Glutathione deficiency.*

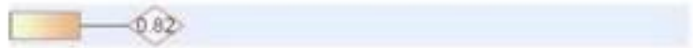
Ammonia is most commonly seen with bacterial, parasitic and H. pylori infections.

Gut dysbiosis

Urea cycle dysfunction

Biopterin deficiency

SALICYLATE marker

Indicators of Detoxification							
Glutathione							
58	Pyroglutamic ●	13	-	62		38	
59	2-Hydroxybutyric ●	0.19	-	2.0		1.5	
Ammonia Excess							
60	Orotic	0.04	-	0.80	H	0.82	
Aspartame, salicylates, or GI bacteria							
61	2-Hydroxyhippuric	≤		1.2	H	15	

● *A high value for this marker may indicate a Glutathione deficiency.*

2-Hydroxyhippuric acid is a phenol marker. Can be associated with dietary intake or bacterial overgrowth.

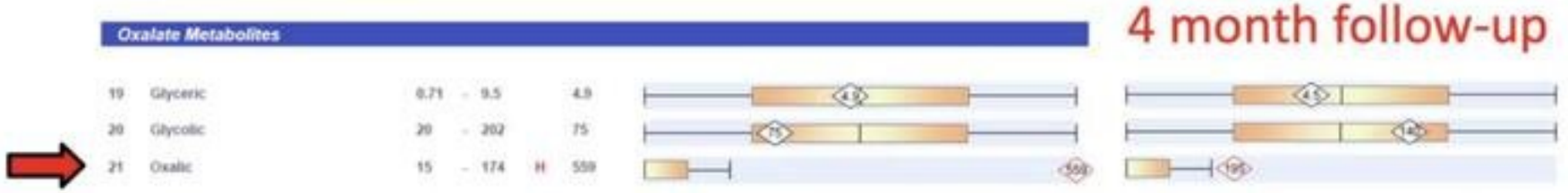
Phase 2 Liver Conjugation = Glycine + phenol

TREATMENT and TESTING

Treatment Considerations	Further Testing
Dietary changes Reduce environmental exposure Correct Methylation Treat gut dysbiosis Provide liver and kidney support	Metals (urine, hair analysis) Porphyrins (urine) Environmental toxins (urine) Liver function tests (not what I typically do) Methylation panels Gene SNPs

Case Study - GIT

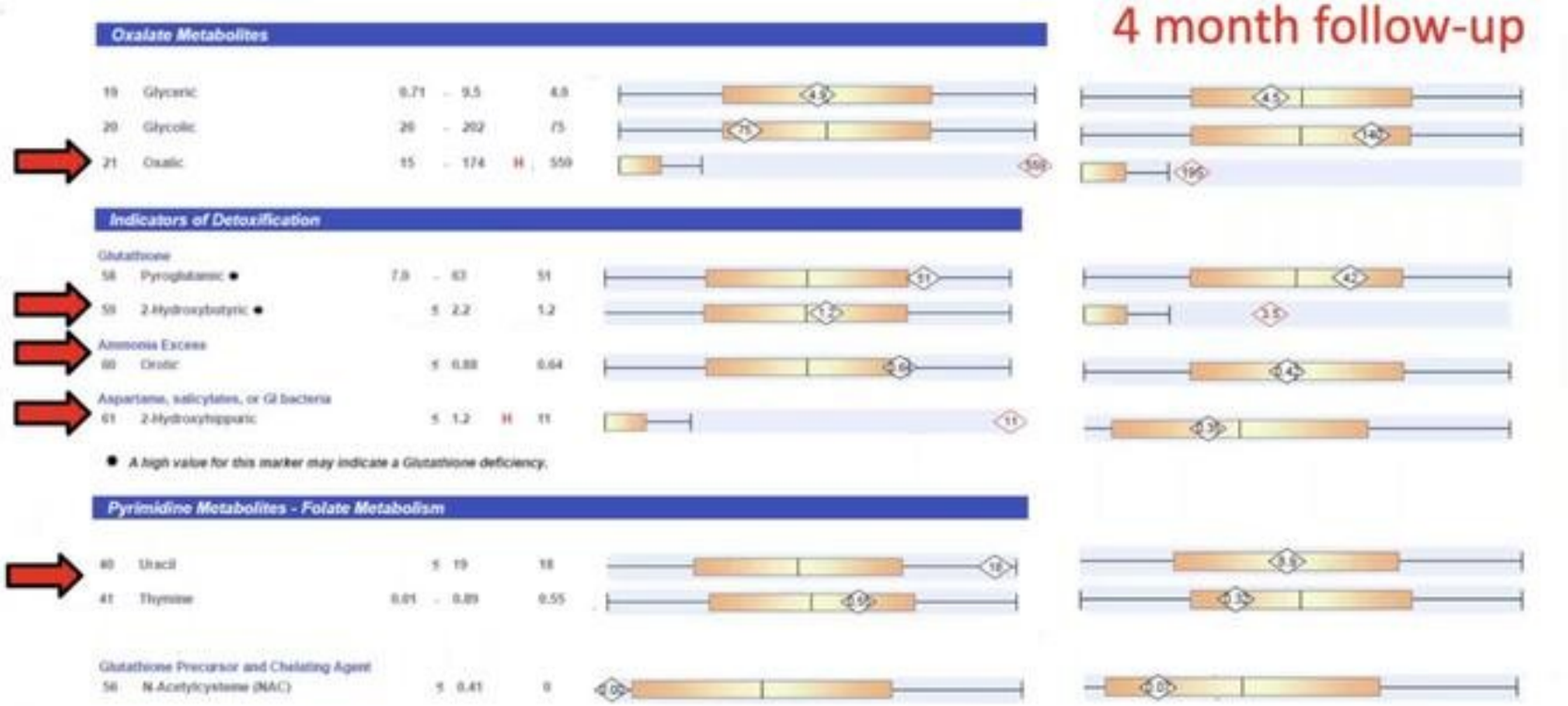
4 month follow-up



Oxalate Metabolites						
19	Glyceric	0.71 - 9.5		4.9		
20	Glycolic	20 - 202		75		
21	Oxalic	15 - 174	H	559		
Vitamin B6						
51	Pyridoxic (B6)	≤ 59		9.3		
Ammonia Excess						
60	Orotic	≤ 0.88		0.64		
Aspartame, salicylates, or GI bacteria						
61	2-Hydroxyhippuric	≤ 1.2	H	11		

Case Study - Detox

4 month follow-up



Things to Remember

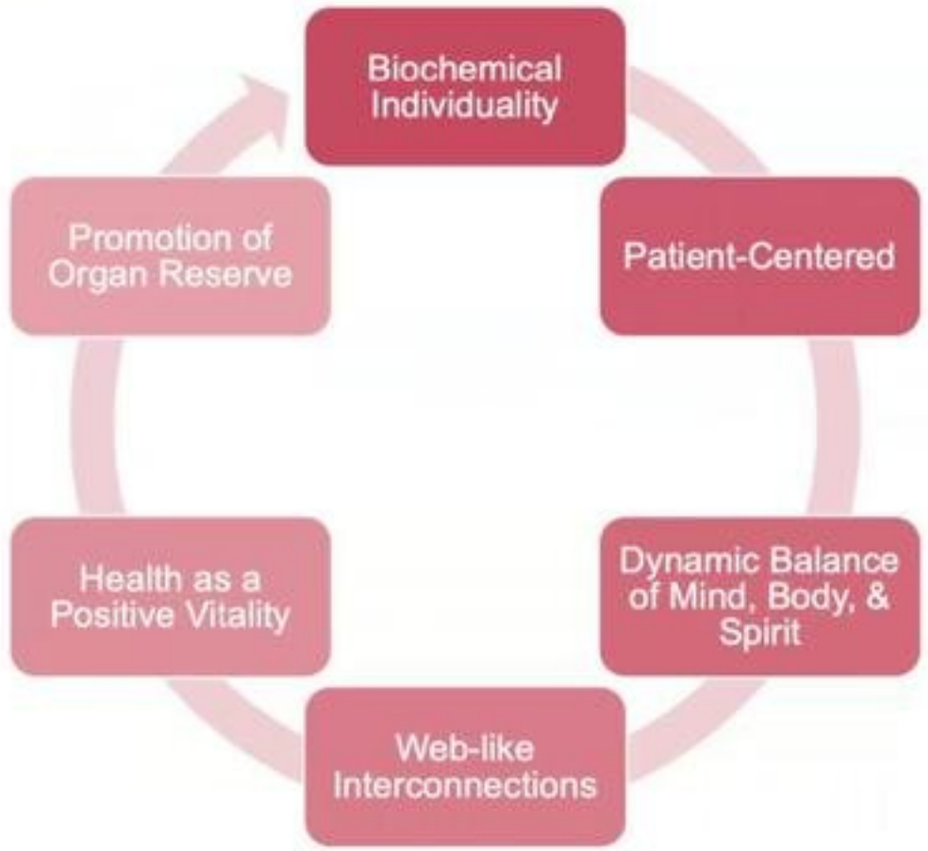
Don’t get lost in the individual markers. See the big picture.

Fundamentals are still important – diet, lifestyle, environment, stress management, sleep habits

Seven Core Imbalances

Assimilation:	• digestion, absorption, microbiota/GI, respiration
Defense and repair:	• immune, inflammation, infection/microbiota
Energy:	• energy regulation, mitochondrial function
Biotransformation & elimination:	• toxicity, detoxification
Transport:	• cardiovascular and lymphatic systems
Communication:	• endocrine, neurotransmitters, immune messengers
Structural integrity:	• subcellular membranes to musculoskeletal integrity

Six Principles of FM



5R/4R Protocol

Remove	Pathogens, food sensitivities, PPI
Replace	Vitamins, minerals, enzymes, gastric acid, fatty acids, antioxidants
Reinoculate	Probiotics, prebiotics, synbiotics
Repair	L-glutamine, anti-inflammatory therapy
Rebalance	Stress and lifestyle issues

5 Causes of Environmental Illness

1. Toxins
   - biologic, elemental, synthetic
2. Allergens
   - food, mold, dust, animal products, pollens, chemicals
3. Microbes
   - bacteria, yeast, viruses, parasites, worms
4. Stress
   - physical or psychological
5. Poor diet
   - standard American diet, or SAD

Four P's of FM

Personalized

- Genetic and environmental variations drive and define individual treatment

Predictive

- Tailored health strategy based on personalized map of health risks with traditional and novel biomarkers

Preventative

- Proactive vs. reactive approaches that shift focus from illness to wellness, from disease treatment to functional enhancement

Participatory

- Empowers and engages the patient

A Word about Testing…

"Test, Don't Guess?"