

The Great Plains Laboratory
GPL Academy
Practitioner Workshops

BEYOND THE BASICS:
ADVANCED ORGANIC ACIDS TESTING STRATEGIES

KURT WOELLER, DO

Cases Studies, Case Examples, and Intervention Options

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BEYOND THE BASICS:
ADVANCED ORGANIC ACIDS TESTING STRATEGIES

I, Kurt N. Woeller, DO, have the following commercial relationships to disclose:

- Founder of Integrative Medicine Academy
- Consultant for Great Plains Laboratory

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Disclaimer

- ▶ The material contained within this presentation is not intended to replace the services and/or medical advice of your personal licensed health care professional.
- ▶ This material is for educational purposes only
- ▶ This information is not meant to encourage diagnosis and treatment of disease.
- ▶ Any application of suggestions set forth in the following portions of this presentation is at the reader's discretion.
- ▶ Implementation and/or experimentation with any supplements, herbs, dietary changes, medications, and/or lifestyle changes, etc., is done so at your sole risk and responsibility.

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Clostridia Intervention

Examples of Various Treatment Approaches

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Clostridia Intervention Statement

- ▶ The following case examples for *clostridia* intervention are from my (Kurt N. Woeller, D.O.) practice going back many years.
- ▶ There are many methods, e.g., antibiotics, botanicals, stool transplant, known to be helpful for *clostridia* bacteria, including *C. difficile* induced diarrhea, bowel inflammation, e.g., pseudomembranous colitis.
- ▶ The following case examples are from patients without life-threatening infections whose *clostridia* problems were detected via the OAT.
- ▶ These cases are not representative for all *C. difficile* clinical scenarios and any person with documented *C. difficile* who is suffering with severe health problems such as fever, weight loss, abdominal cramping, loose and/or bloody stools should be evaluated and treated medically.

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Clostridia - Antibiotic Treatments

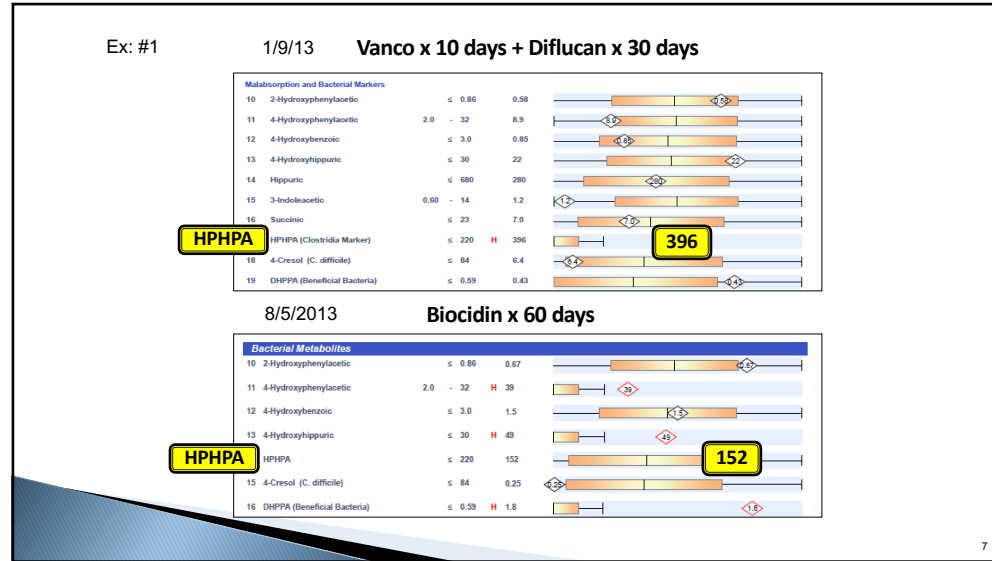
- ▶ **Flagyl** (Metronidazole) – 250mg to 500 mg TID X 10 days
- ▶ **Vancomycin** (Vancocin) – 125mg to 500 mg QID X 10 days
- ▶ **Dificid** (Fidaxomicin) - 200mg BID X 10 days

Cyclical Dosing Options (examples):

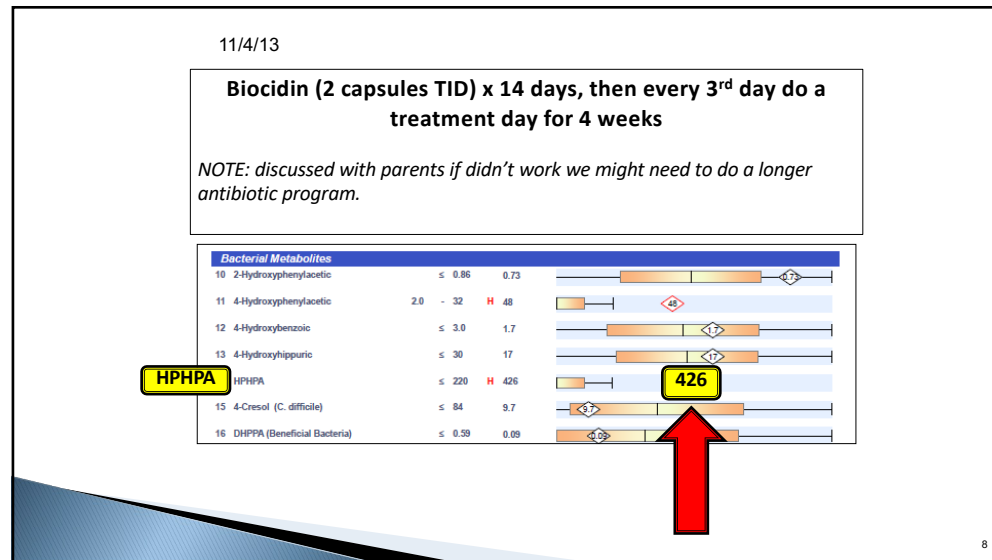
1. Every 3rd day for 27 days (*McFarland, 2005*)
2. Dificid 200mg BID x 5 days, then once daily QOD days 7 to 25 (*Lancet 2018*).
3. Vancomycin QOD + Q3D (*IDSA, 2017*)
4. **One dose TID for 10 days, then:**
 - *One treatment day (one dose three times/day) every 72 hours for 3 weeks*

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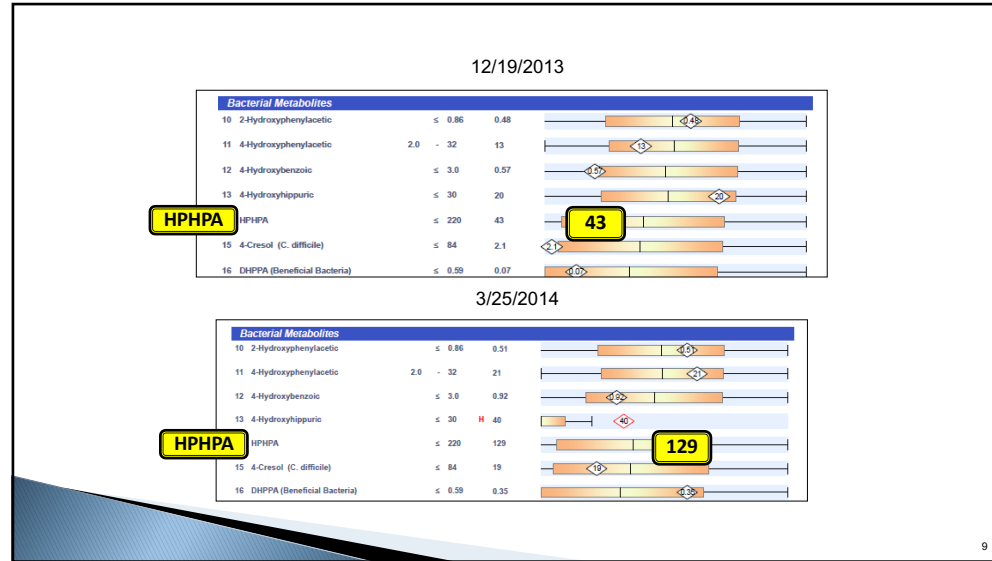
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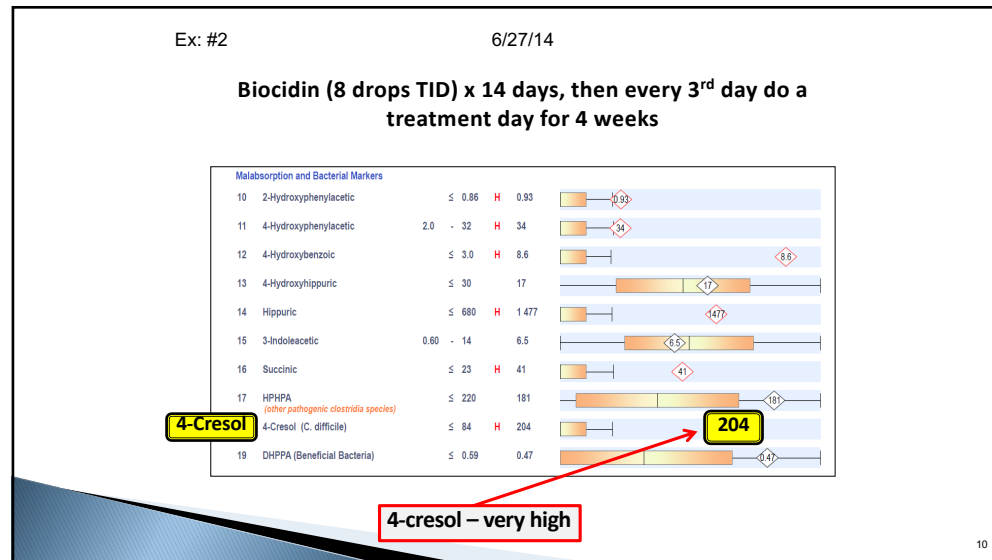
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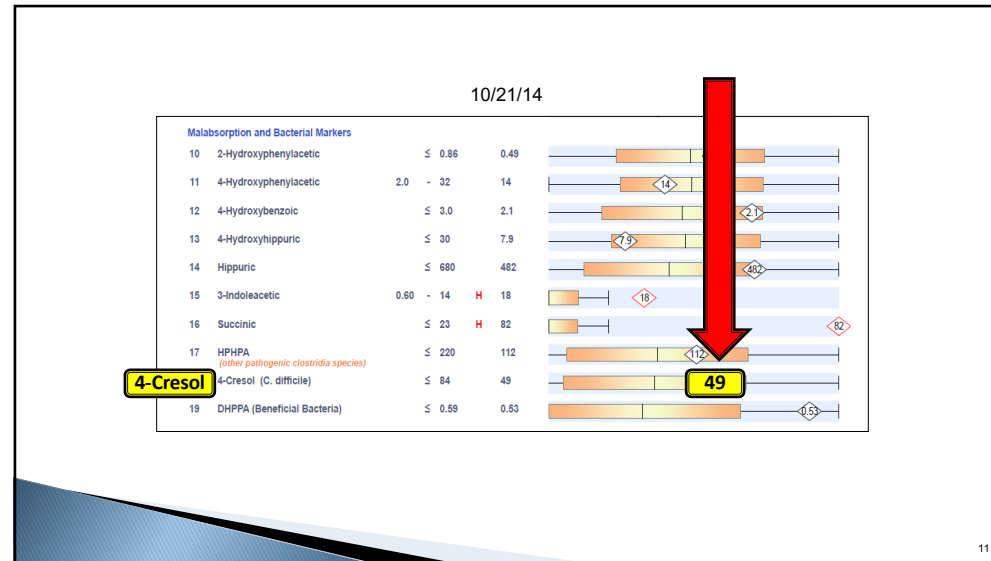
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Recurrent Clostridia Intervention Supplement Dosing Options

Dosing Example:

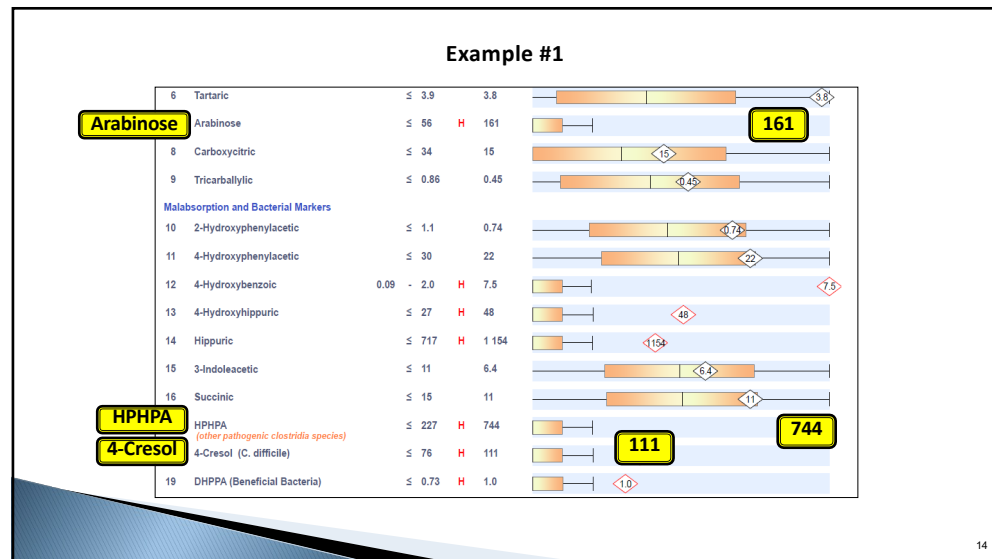
- ▶ **Biocidin** – 1 to 3 capsules (or 5 to 15 drops of liquid) TID for 14 days, then every 3rd day do one treatment day for 4+ weeks.
- ▶ Berberine or other botanical (e.g. garlic extract) for added anti-pathogen effect.
- ▶ **High Potency Probiotics** – Visbiome, ProBio Premium, Custom Probiotics D-Lactate, Culturelle (multiple capsules), soil-based organism probiotics.

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Additional OAT Results After Clostridia Intervention

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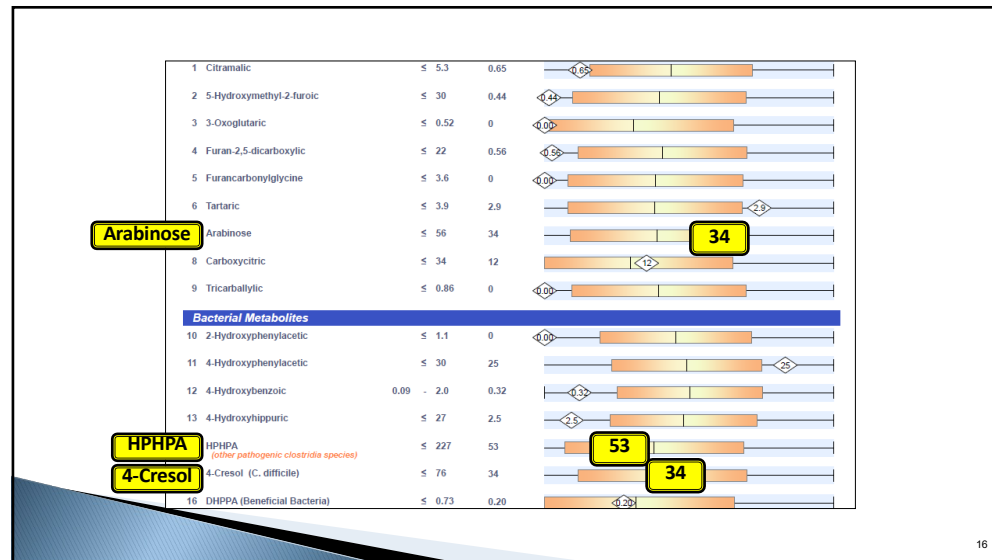


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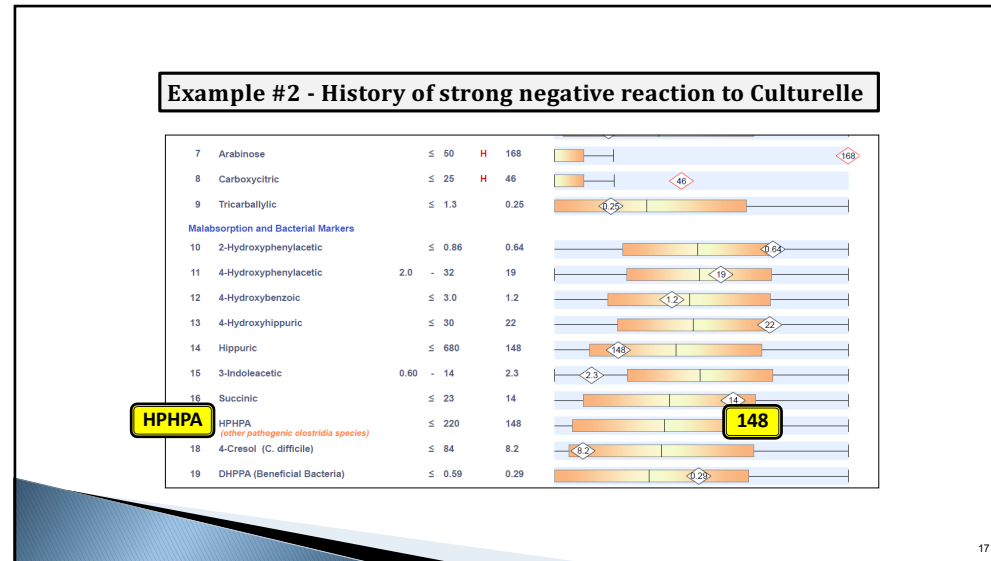
Program

- ▶ **Biocidin** – 8 drops TID for 14 days, then every 72 hours did another treatment day (of 8 drops TID) for additional 4 weeks:
 - **Culturelle** – 4 capsules at night 90 minutes away from last dose of Biocidin.
- ▶ Retested Microbial Organic Acids Test during the last week of Biocidin program.

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Program

- ▶ **Biocidin** – 5 drops TID every other day for 6 weeks
 - **Ther-Biotic Complete** – ¼ teaspoon nightly 90 minutes away from last dose of Biocidin.
- ▶ Repeat Microbial Organic Acids Test in 6 weeks during the last week of Biocidin use.

18

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Decided not to implement my program

7	Arabinose	≤ 60	H	82	
8	Carboxycitric	≤ 25		3.0	
9	Tricarballic	≤ 1.3		0.40	
Malabsorption and Bacterial Markers					
10	2-Hydroxyphenylacetic	≤ 0.86		0	
11	4-Hydroxyphenylacetic	2.0 - 32	H	64	
12	4-Hydroxybenzoic	≤ 3.0		0.91	
13	4-Hydroxyhippuric	≤ 30	H	47	
14	Hippuric	≤ 680		143	
15	3-Indoleacetic	0.60 - 14	L	0.48	
16	Succinic	≤ 23		8.8	
	HPHPA				
	HPHPA (other pathogenic clostridia species)	≤ 220	H	437	
18	4-Cresol (C. difficile)	≤ 84		45	
19	DHPPA (Beneficial Bacteria)	≤ 0.59		0.15	

HPHPA

437

YIKES!

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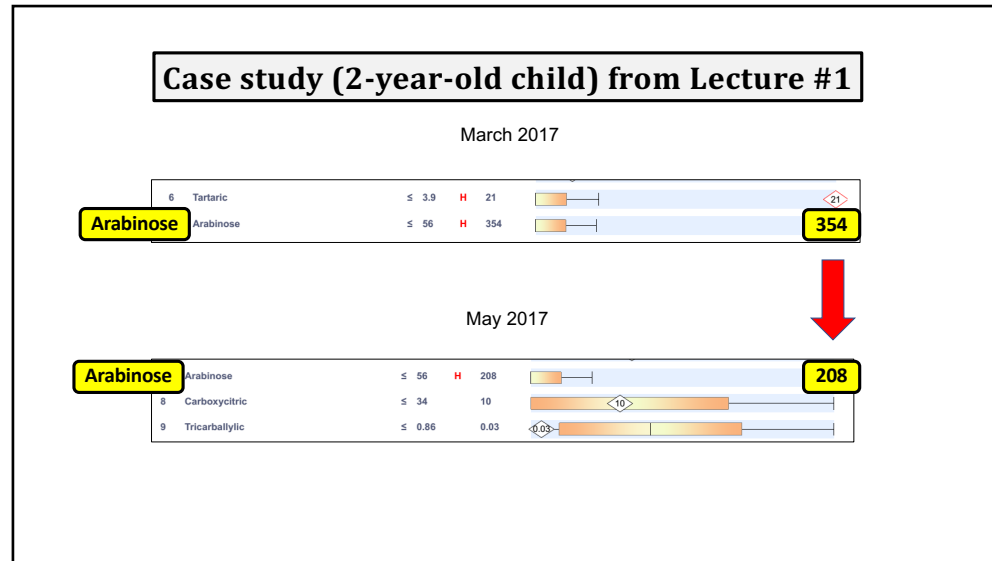
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General OAT Testing Recommendations For Clostridia Bacteria Toxins

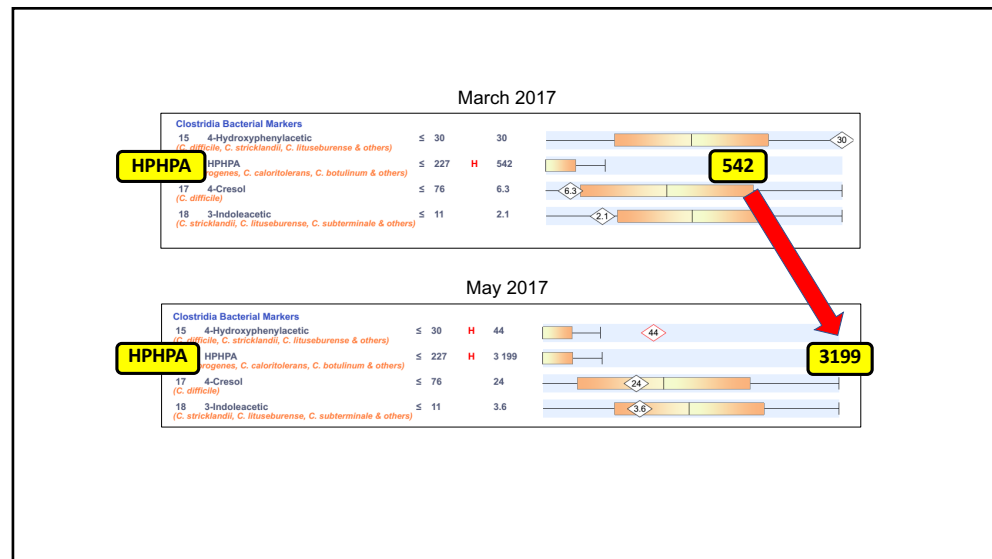
- ▶ Obtain initial Organic Acids Test (OAT) or Microbial Organic Acids Test (mOAT) to obtain baseline of *clostridia* markers.
- ▶ Initiate antimicrobial therapy (botanical and/or medication) based on clinical presentation of patient.
- ▶ If doing just 10 days of antibiotics, retest OAT or mOAT one to two weeks after regimen completed and again one to two months later.
- ▶ If doing extended cyclical program, retest OAT or mOAT during the last week of therapy and then again one to two months later.

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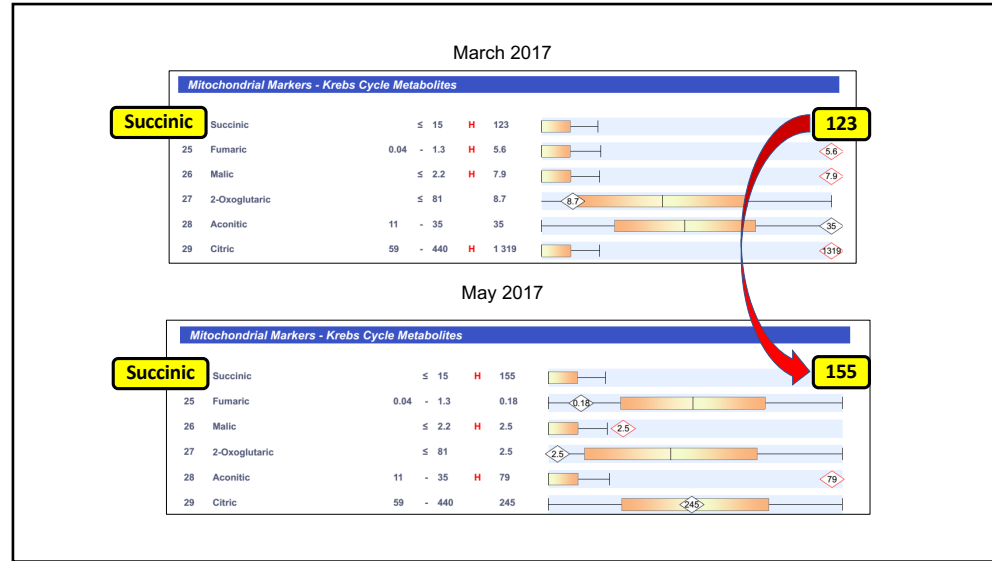
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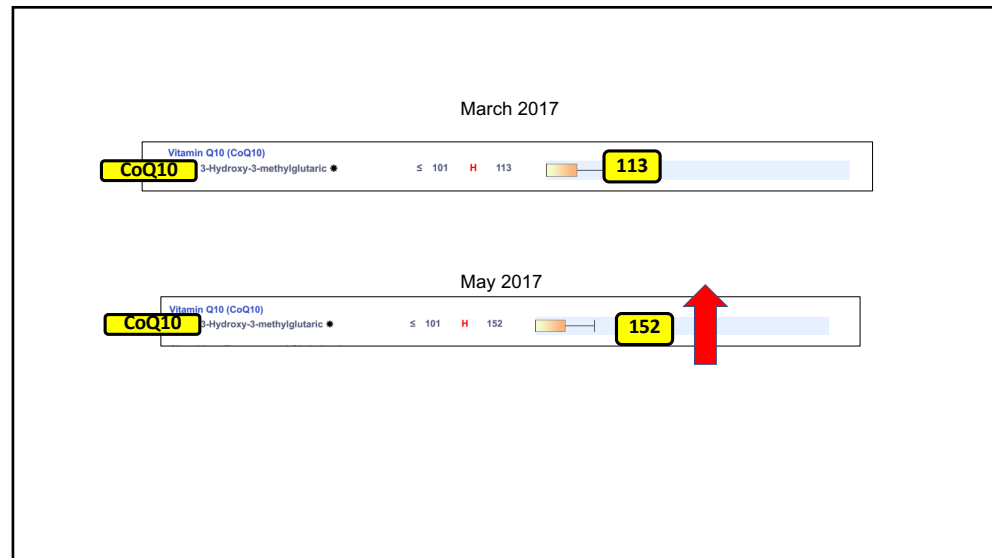
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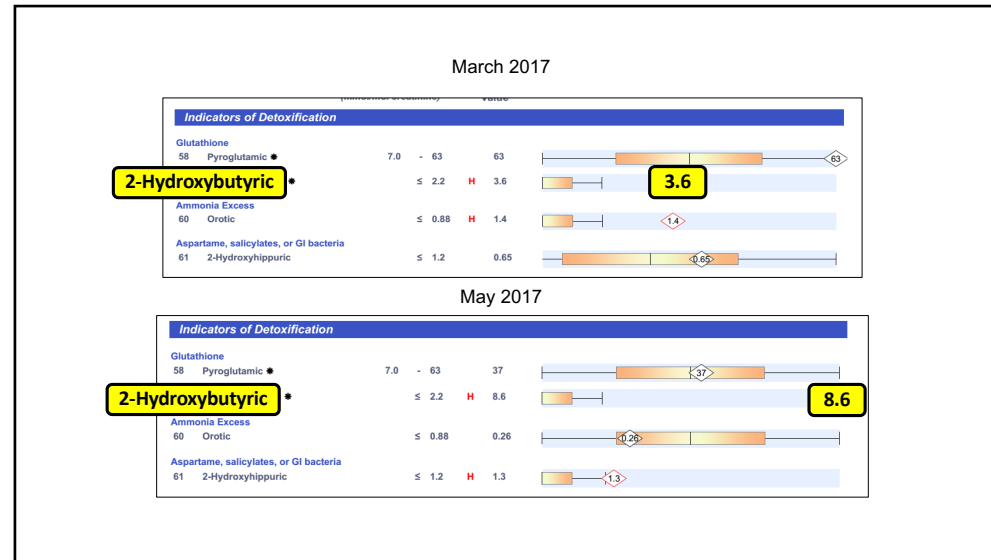
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Antibiotic Protocol Used

Cyclical Dosing Options (examples):

- Every 3rd day for 27 days (McFarland, 2005)
- Dificid 200mg BID x 5 days, then once daily QOD days 7 to 25 (Lancet 2018).
- One dose TID for 10 days, then:
 - Every 3rd day – one treatment day (one dose TID) for 3 weeks

- ▶ Flagyl (metronidazole):
 - One dose three times daily (TID) x 10 days, then
 - One dose TID (for treatment day) used every 72 hours for additional 3 weeks
- ▶ Nystatin:
 - ½ teaspoon TID (250,000 units) prescribed for 8 weeks
- ▶ Soil Based Probiotic – 1 to 2+ capsules daily

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Three OAT Reports From Patient

	Arabinose	HPHPA	Oxalate	Succinic	*CoQ10	PYRG
March	354	542	346	123	113	63
May	208	3199	253	155	152	37 ↓
Sept	270	71	43	6.6	25	18 ↓

Asterisk* for CoQ10 is an indirect marker. Also, no change in reference ranges between tests.

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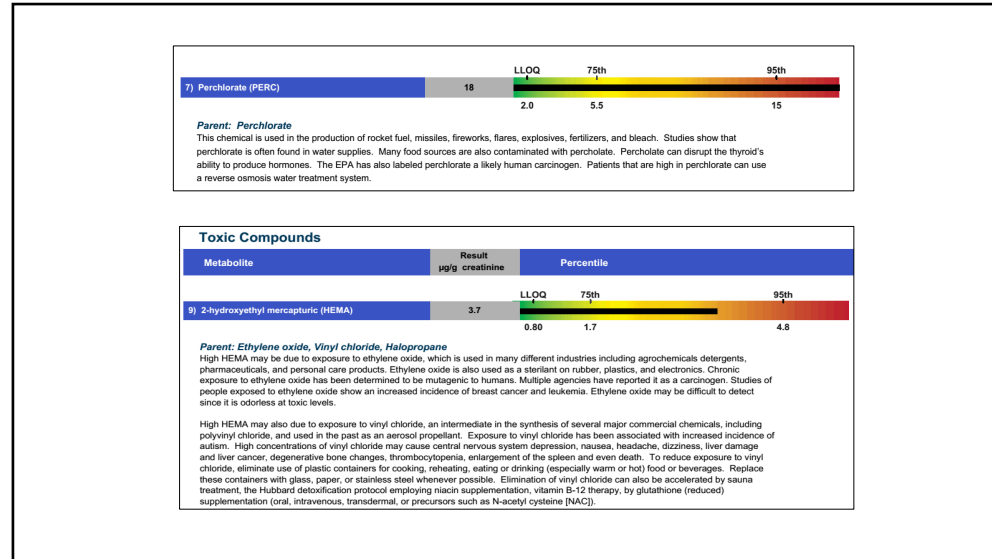
Toxic Non-Metal Chemical Profile

Requisition #: [REDACTED] *Physician Name:* KURT WOELLER DO
Patient Name: [REDACTED] *Date of Collection:*
Patient Age: 2 *Time of Collection:*
Sex: F *Print Date:*

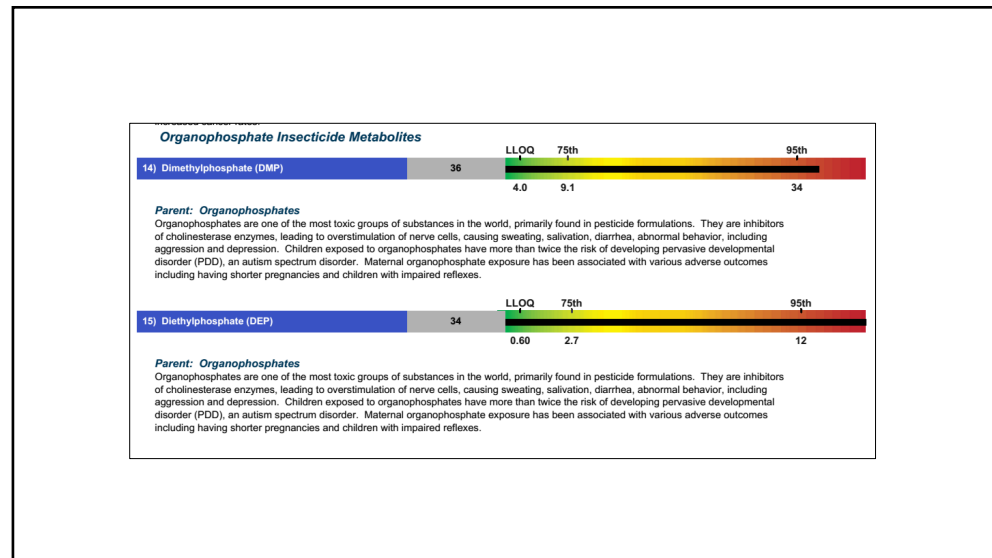
Toxic Compounds

Metabolite	Result µg/g creatinine	Percentile
Industrial Toxicants		
1) 2-Hydroxyisobutyric Acid (2HIB)	7,122	<div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">LLOQ</div> <div style="flex-grow: 1; border: 1px solid black; position: relative;"> <div style="position: absolute; top: -5px; left: 50%; transform: translate(-50%, -50%);">75th</div> <div style="position: absolute; top: -5px; right: 50%; transform: translate(50%, -50%);">95th</div> <div style="position: absolute; bottom: -5px; left: 50%; transform: translate(-50%, -50%);">200</div> <div style="position: absolute; bottom: -5px; right: 50%; transform: translate(50%, -50%);">5,530</div> <div style="position: absolute; bottom: -5px; right: 50%; transform: translate(50%, -50%);">7,000</div> </div> </div>
<i>Parent: MTBE/ETBE</i> MTBE and ETBE are gasoline additives used to improve octane ratings. Exposure to these compounds is most likely due to groundwater contamination, inhalation or skin exposure to gasoline or its vapors, and exhaust fumes. MTBE has been demonstrated to cause hepatic, kidney, and central nervous system toxicity, peripheral neurotoxicity, and cancer in animals. Very high values have been reported in genetic disorders. Because the metabolites of these compounds are the same, ETBE may be similarly toxic.		
2) Monoethylphthalate (MEP)	37	<div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">LLOQ</div> <div style="flex-grow: 1; border: 1px solid black; position: relative;"> <div style="position: absolute; top: -5px; left: 50%; transform: translate(-50%, -50%);">75th</div> <div style="position: absolute; top: -5px; right: 50%; transform: translate(50%, -50%);">95th</div> <div style="position: absolute; bottom: -5px; left: 50%; transform: translate(-50%, -50%);">5.0</div> <div style="position: absolute; bottom: -5px; right: 50%; transform: translate(50%, -50%);">150</div> <div style="position: absolute; bottom: -5px; right: 50%; transform: translate(50%, -50%);">850</div> </div> </div>
<i>Parent: Diethylphthalates</i> Phthalates may be the most widespread group of toxins in our environment, commonly found in many bath and beauty products, cosmetics, perfumes, oral pharmaceuticals, insect repellants, adhesives, inks, and varnishes. Phthalates have been implicated in reproductive damage, depressed leukocyte function, and cancer. Phthalates have also been found to impede blood coagulation, lower testosterone, and alter sexual development in children. Low levels of phthalates can feminize the male brain of the fetus, while high levels can hyper-masculinize the developing male brain.		

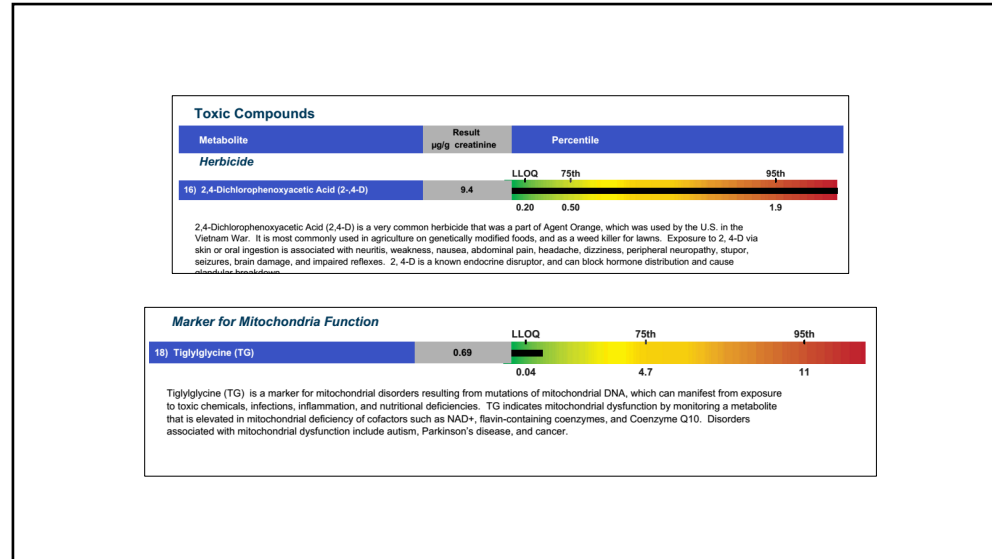
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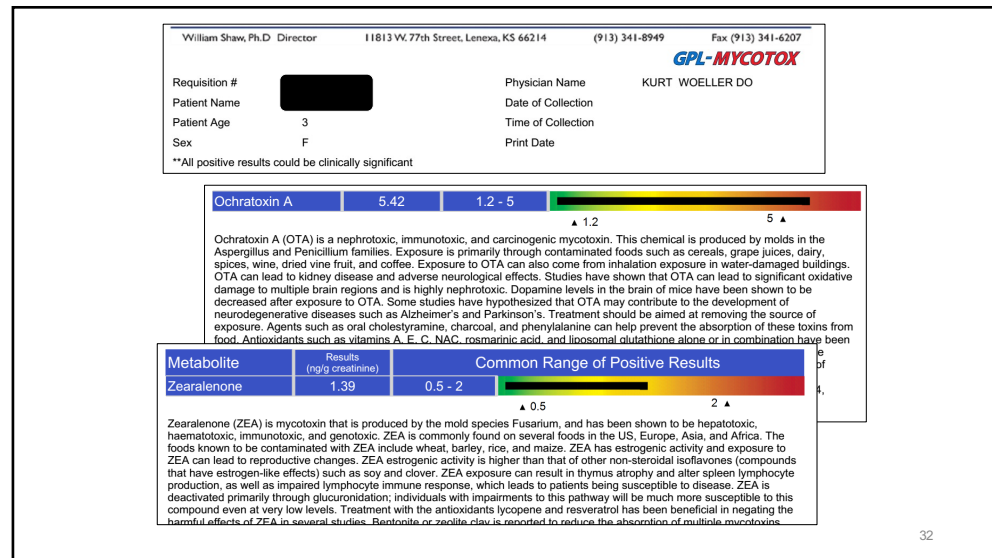
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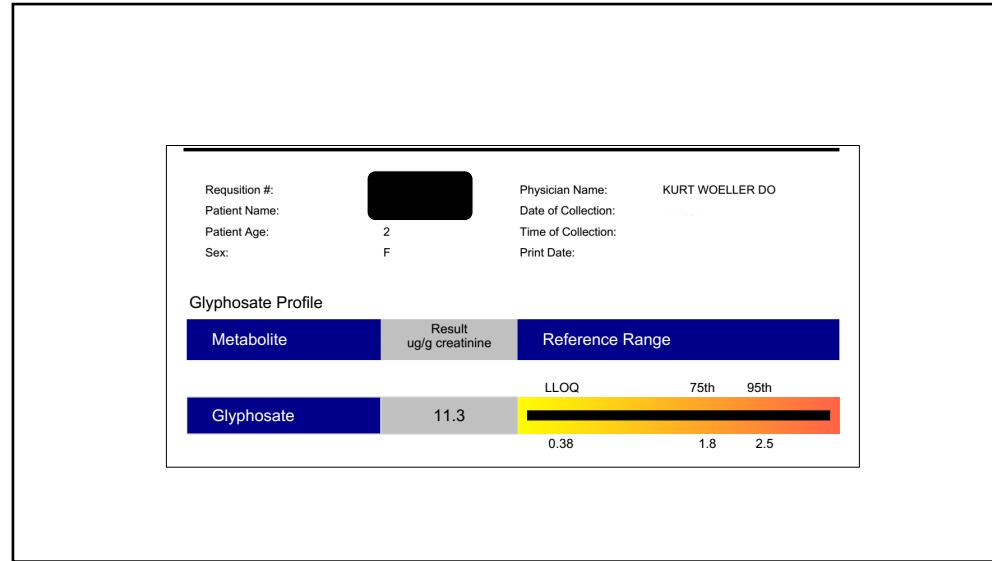
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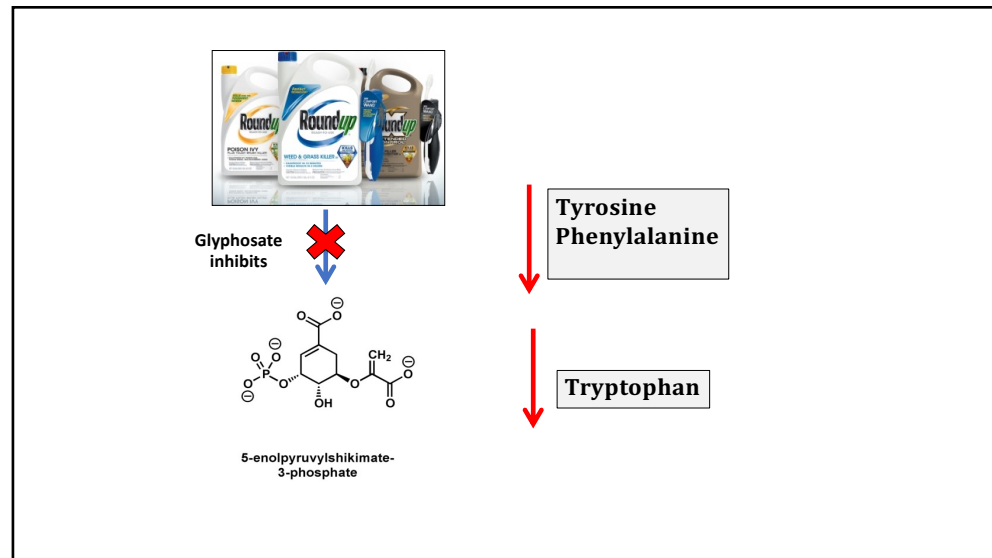
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Schemata AA, et al. The effect of glyphosate on potential pathogens and beneficial members of poultry microbiota in vitro. Curr Microbiol. 2013 Apr;66(4):350-8.

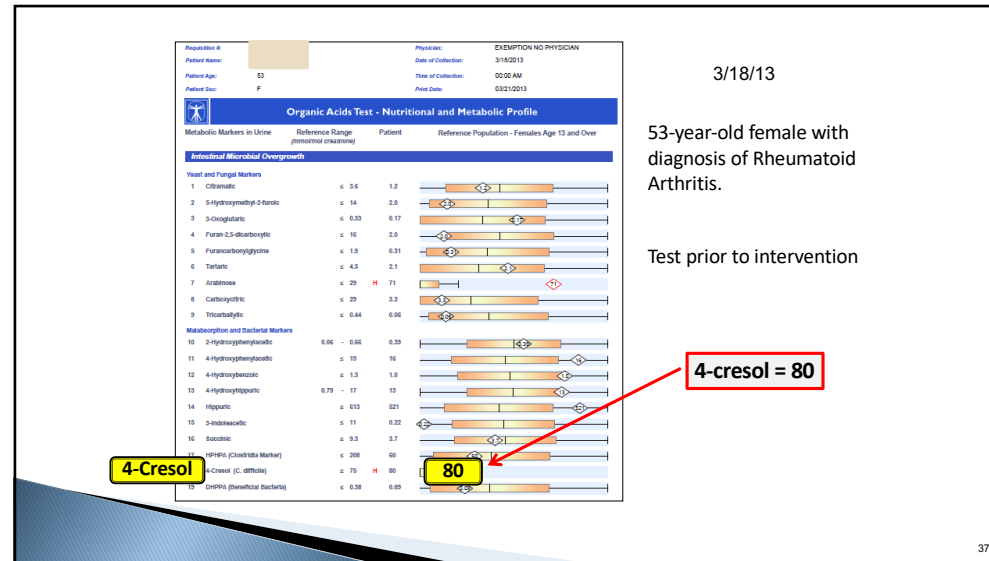
- ▶ Glyphosate disrupts the microbiome in the intestine, causing a decrease in the ratio of beneficial to harmful bacteria.
- ▶ Highly pathogenic bacteria such as *Salmonella enteritidis*, *Salmonella gallinarum*, *Salmonella typhimurium*, *Clostridium perfringens*, and *Clostridium botulinum* are highly resistant to glyphosate.
- ▶ Most beneficial bacteria such as *Enterococcus faecalis*, *Enterococcus faecium*, *Bacillus badius*, *Bifidobacterium adolescentis* and *Lactobacillus spp.* were found to be moderate to highly susceptible.

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Rheumatoid Arthritis and Clostridia

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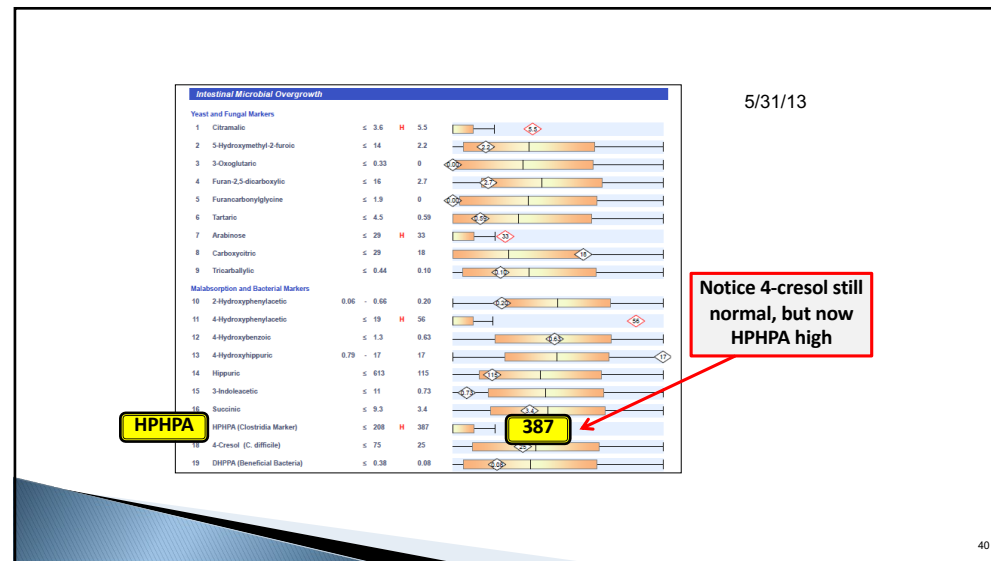
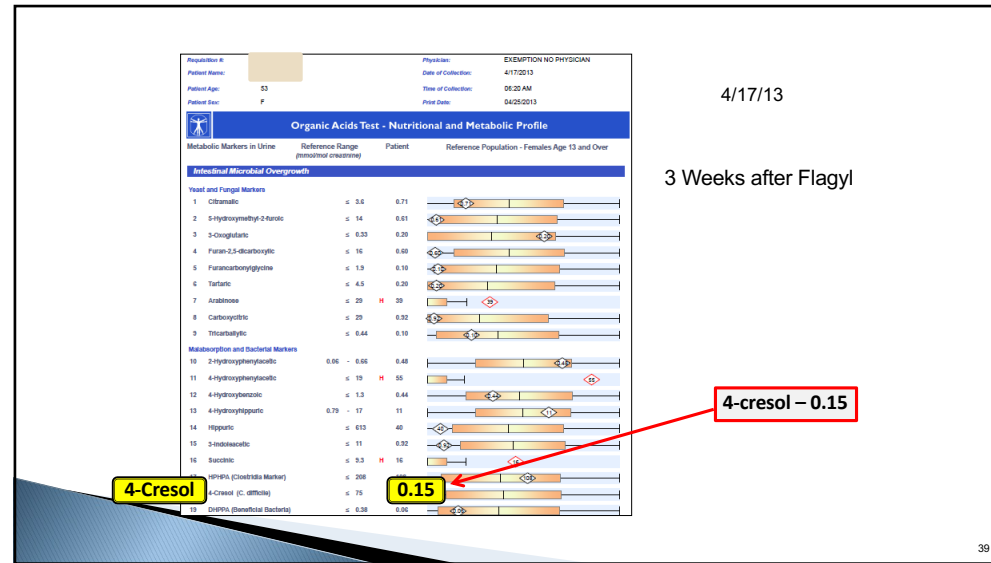


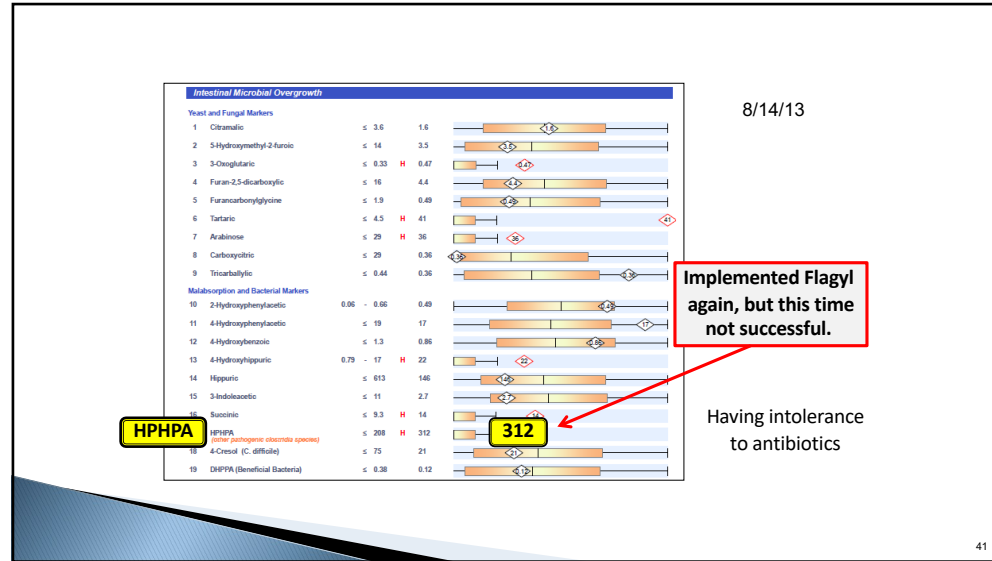
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Rheumatoid Arthritis

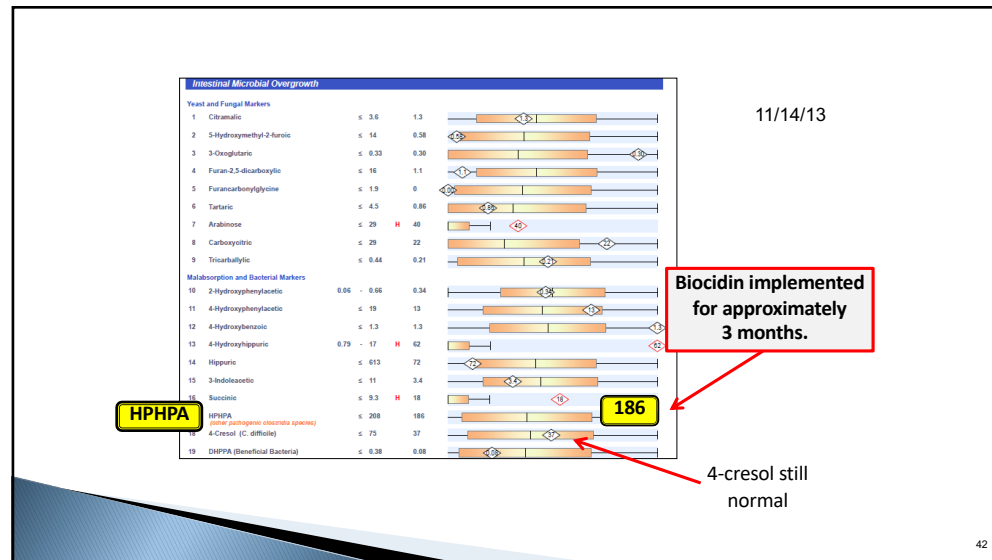
- ▶ Food IgG elimination diet, e.g., gluten, dairy
- ▶ Avoiding nightshade foods such as potatoes, peppers, eggplant, etc.
- ▶ Multivitamin/mineral/antioxidant
- ▶ Essential fatty acids
- ▶ Curcumin
- ▶ Multi-strain probiotic
- ▶ Low Dose Naltrexone

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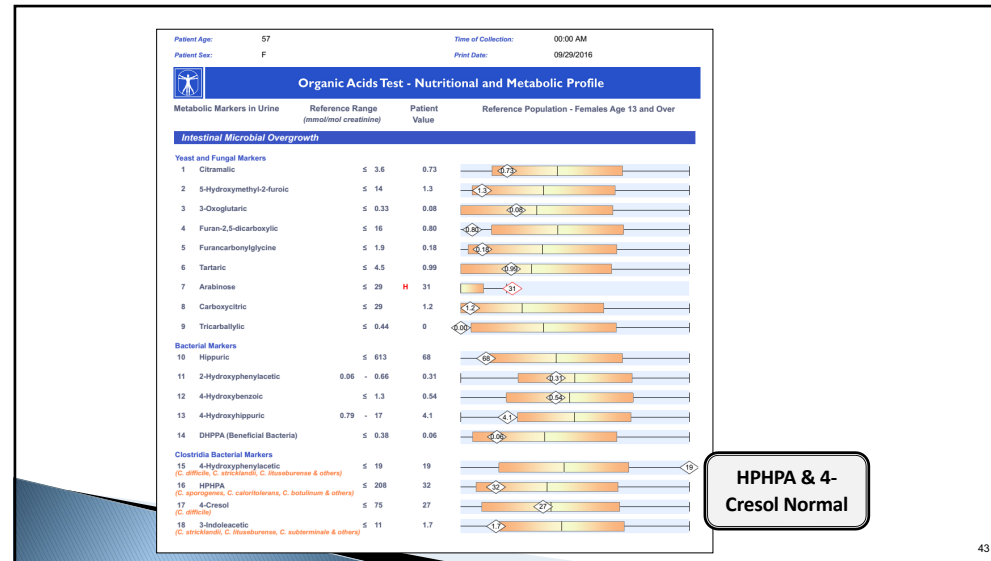




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Final Comment on Clostridia Intervention


- ▶ If using a combination botanical, e.g. Biocidin, or various singular remedies, e.g. berberine, one option is to use daily dosing for multiple months and then retest the OAT or mOAT to see if the clostridia markers have cleared.
- ▶ If the *clostridia* is recurrent, then implementing a cyclical dosing regimen may be helpful:
 - For example, if a 90-day program is being implemented with daily dosing of botanicals, and a repeat mOAT at 4 to 6 weeks is still showing clostridia markers elevated, then switching to a cyclical program, i.e., every 72 hour dosing for an additional 4 to 6 weeks.

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Organic Acids Test From Individual With Parkinson's Disease

Be cautious with L-Tyrosine supplementation when clostridia is present

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The Great Plains Laboratory, Inc.

William Shaw, Ph.D., Director | 11813 West 77th Street, Lenexa, KS 66214 | (913) 341-8949 | Fax (913) 341-6207

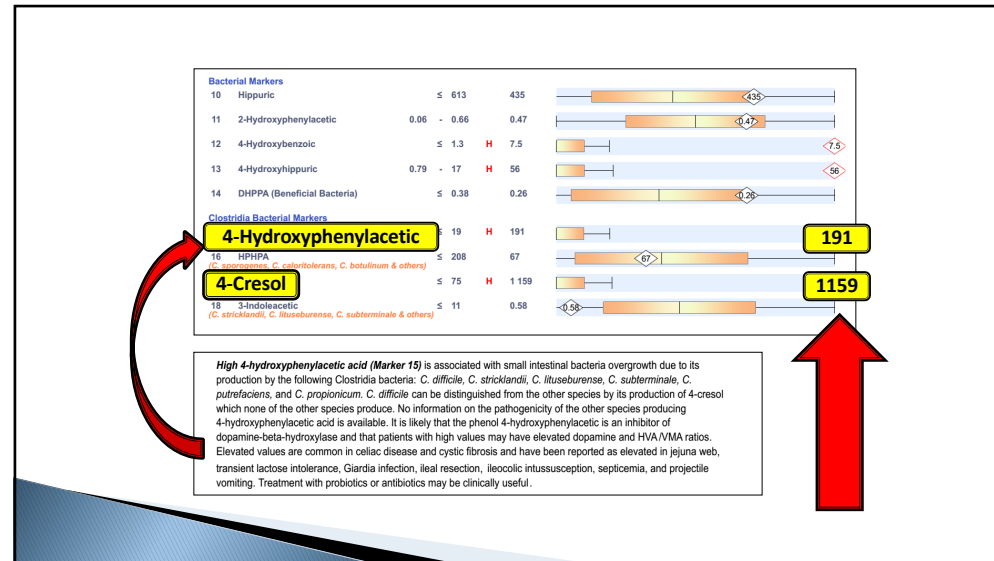
Requisition #: [Redacted] **Physician:** [Redacted]
Patient Name: [Redacted] **Date of Collection:** [Redacted]
Patient Age: 68 **Time of Collection:** 07:00 AM
Patient Sex: F **Print Date:** 05/04/2017

Organic Acids Test - Nutritional and Metabolic Profile

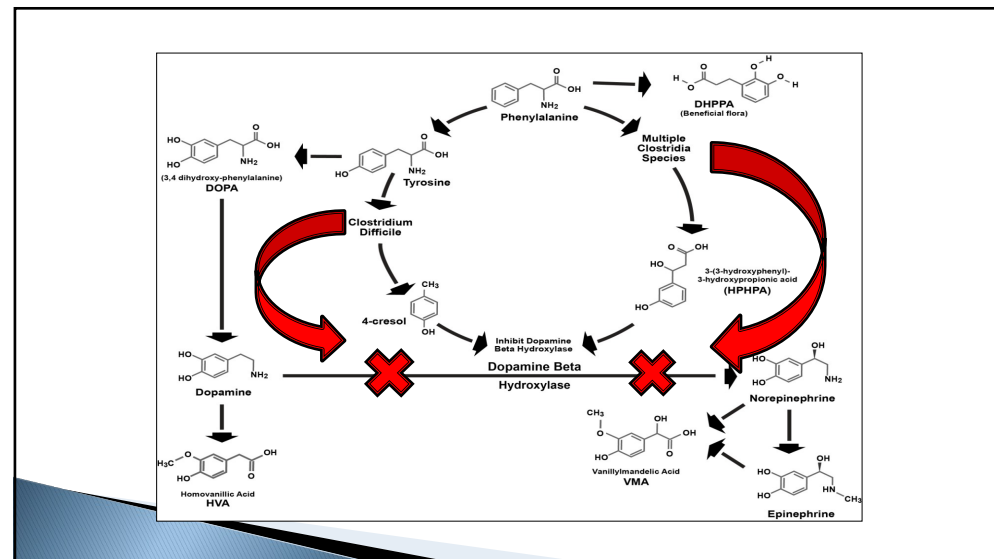
Metabolic Markers in Urine	Reference Range (mmol/mol creatinine)	Patient Value	Reference Population - Females Age 13 and Over
Intestinal Microbial Overgrowth			
Yeast and Fungal Markers			
1 Citramalic	≤ 3.6	0.43	[Bar chart showing 0.43]
2 5-Hydroxymethyl-2-furoic	≤ 14	26 H	[Bar chart showing 26]
3 3-Oxoglutaric	≤ 0.33	0.02	[Bar chart showing 0.02]
4 Furan-2,5-dicarboxylic	≤ 16	15	[Bar chart showing 15]
5 Furan-carbonylglycine	≤ 1.9	1.4	[Bar chart showing 1.4]
6 Tartaric	≤ 4.5	0.32	[Bar chart showing 0.32]
Arabinose	≤ 29	62 H	[Bar chart showing 62]
8 Carboxycitric	≤ 29	0.29	[Bar chart showing 0.29]
9 Tricarballic	≤ 0.44	0.10	[Bar chart showing 0.10]

Arabinose (highlighted in yellow)

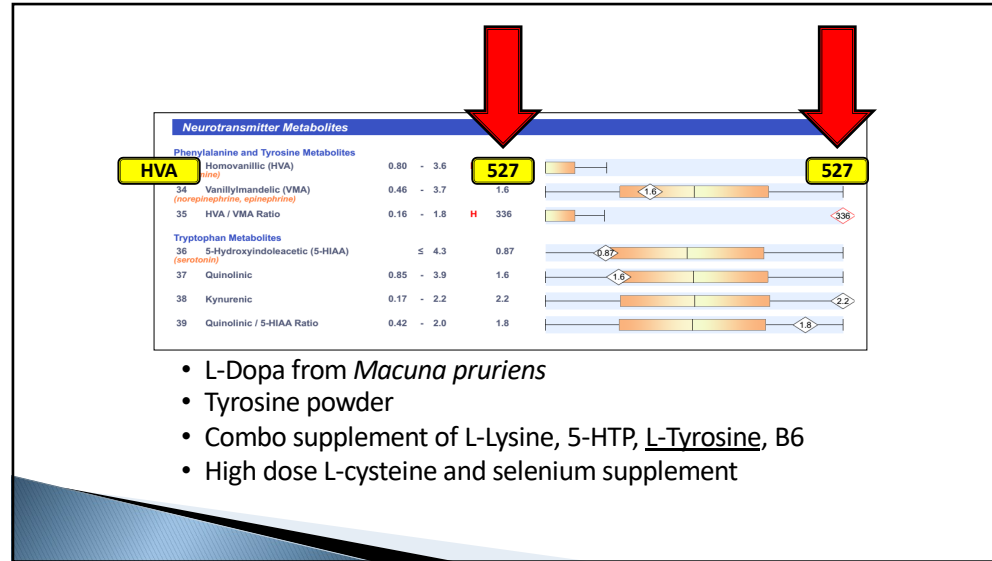
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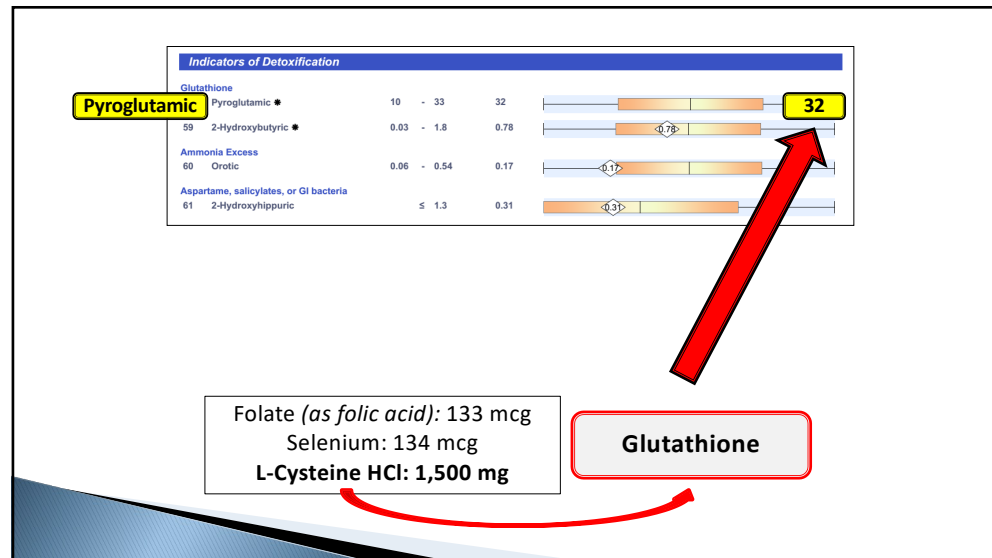
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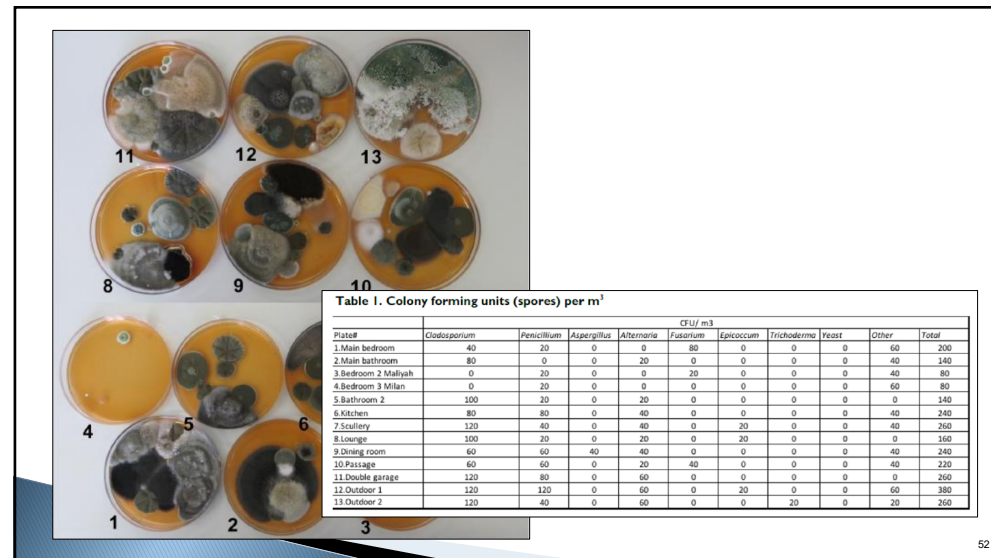
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Complicated Case of Mold Colonization, Candida, Clostridia, Oxalate, Mitochondrial Dysfunction...

*Comparing the previous OAT format
and the new OAT format*

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OATs To Be Reviewed

Previous OAT (initial) & New OAT (follow-up)

<ul style="list-style-type: none"> ▶ 3-year old male ▶ Constipation (severe) ▶ Language delay ▶ Poor social interaction ▶ Screams during the middle of night for hours ▶ Often agitated during day 	<ul style="list-style-type: none"> ▶ Cries when urinates ▶ No self-injury ▶ Aspergillus mold found in home ▶ Respiratory congestion and cough ▶ Gluten and dairy free diet ▶ Lives in S. Africa
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Treatment Program

Flagyl (metronidazole):

- ▶ Flagyl – One dose given three times daily for 10 days straight. Then, a cycling dose for an additional 3 weeks.
- ▶ Cycling dose – one dose given three times per treatment day. A treatment day is done every 72 hours following the completion of the initial 10 days listed above. For example, if the last day of the initial 7 days ends on a Sunday, the cycling dose would be given on Wednesday, then again Saturday and so forth until completed.
- ▶ The cycling phase helps to reduce the recurrence of *clostridia* bacteria and the initial 10 days is to significantly reduce the overall amounts of bacteria present.

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Treatment Program

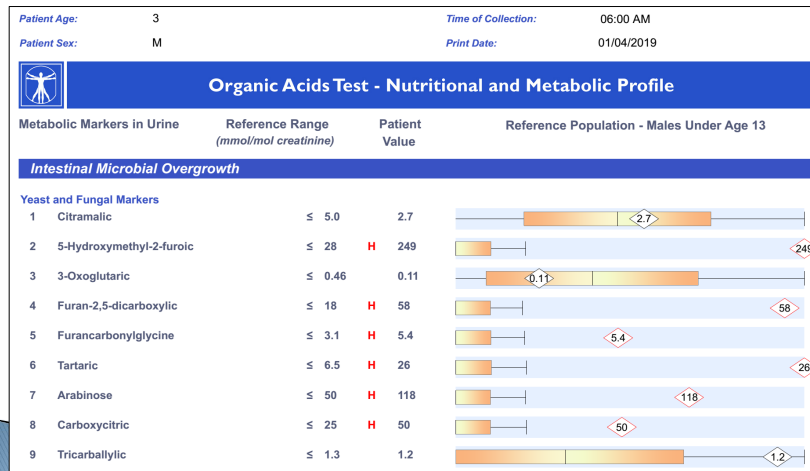
Additional Support:

- ▶ Multivitamin/multimineral/antioxidant
- ▶ Biocidin (liquid) – 5 drops three times daily
- ▶ Probiotic (soil-based organism) – two capsules nightly before bed
- ▶ Oxypowder – one to three capsules nightly for constipation
- ▶ Calcium citrate with meals
- ▶ Nystatin (*oral suspension*) – 5 ml (one teaspoon) TID for 4 weeks, then switched to Diflucan for 4 weeks, then switched to **Sporanox**.
- ▶ GI Detox+ - one capsule twice daily

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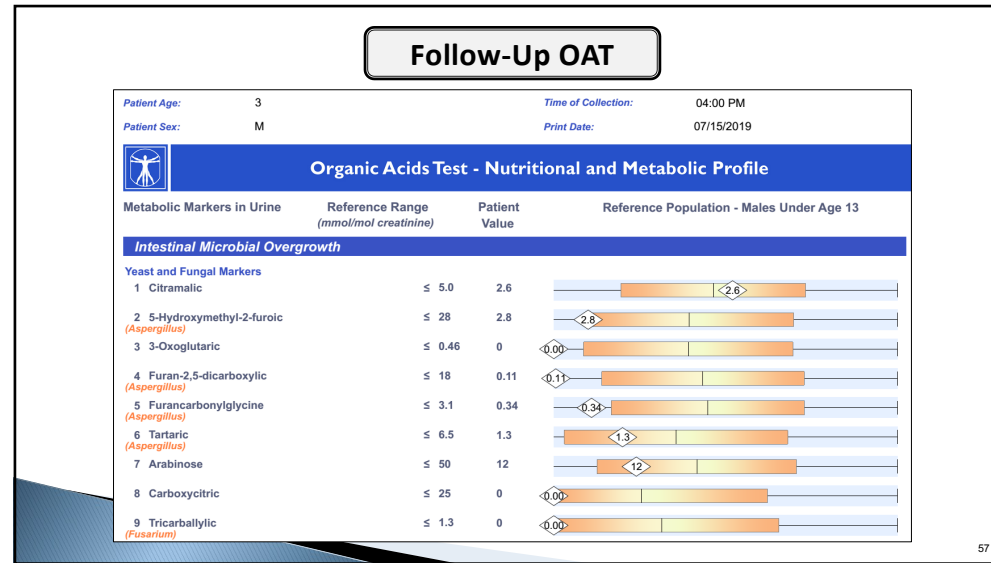
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Initial OAT

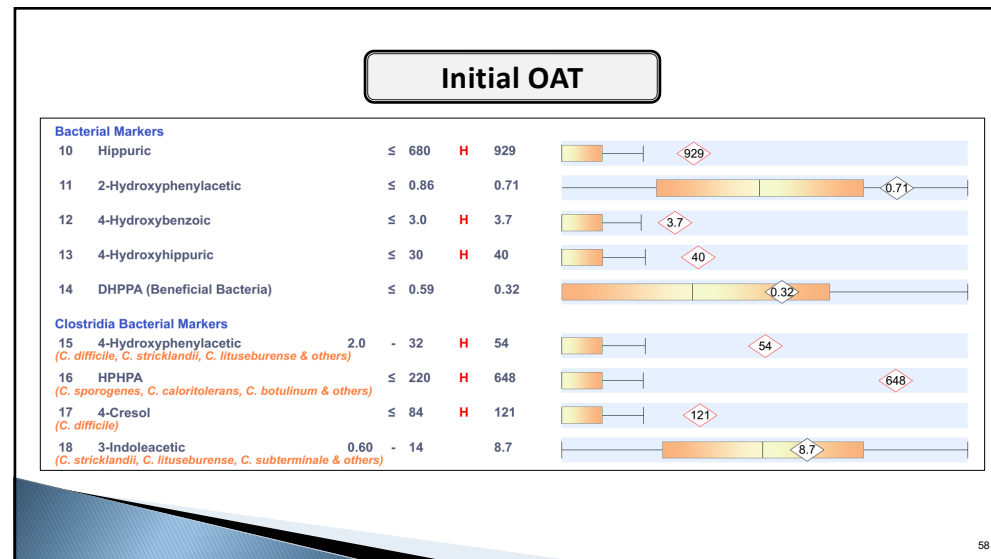


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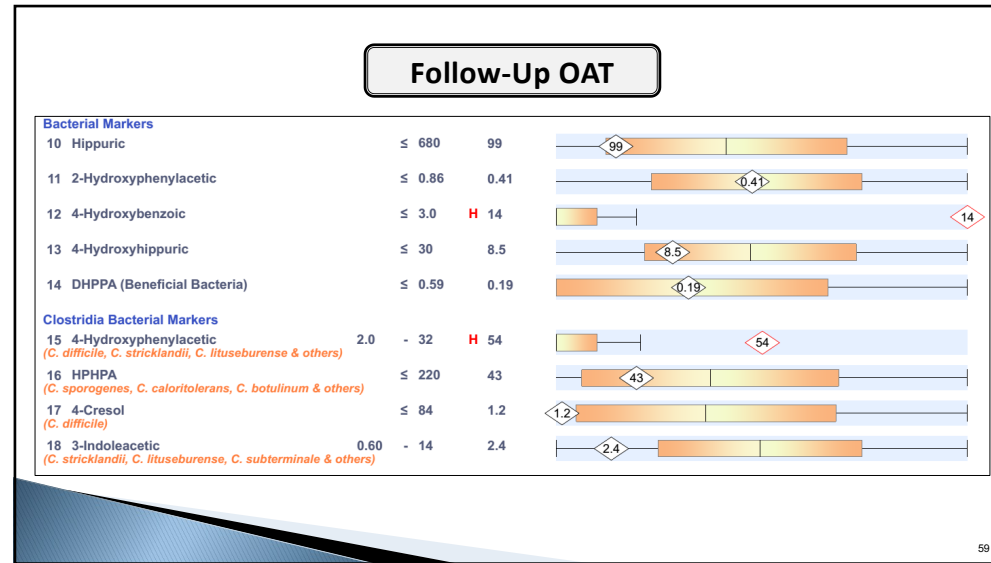
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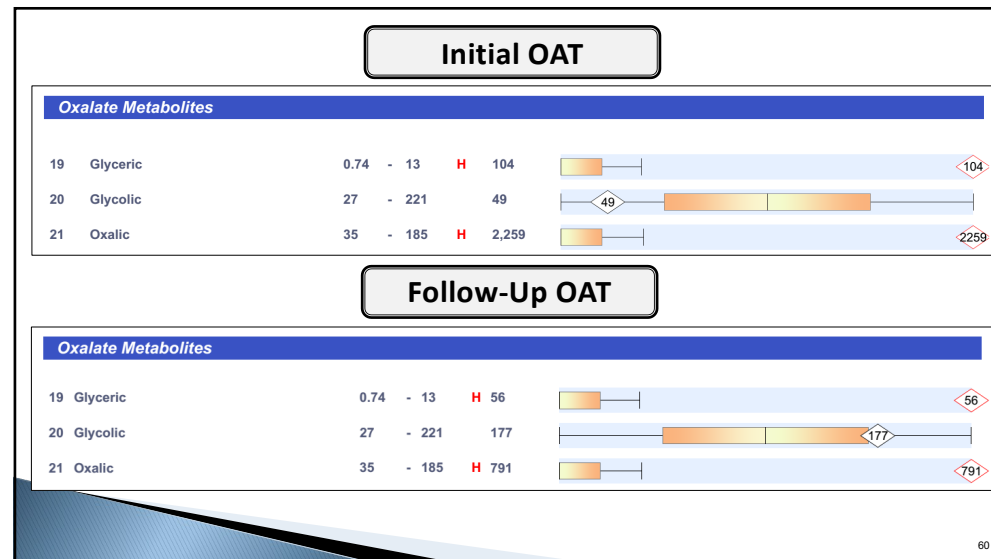
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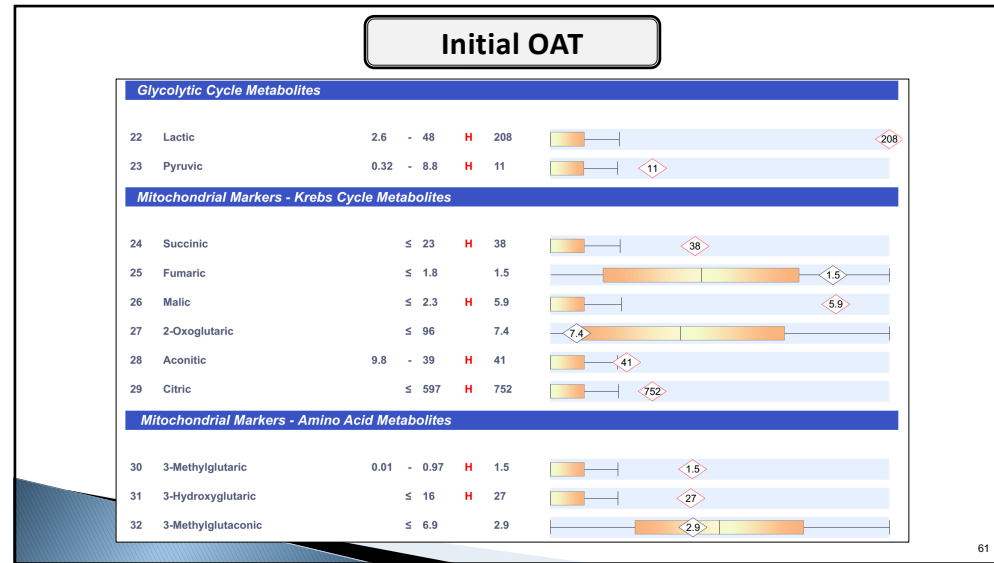
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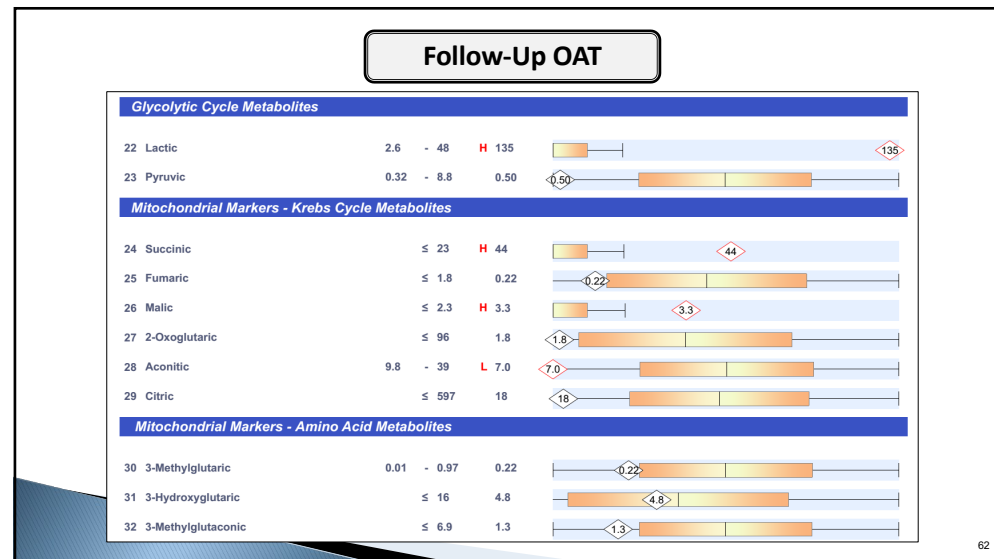
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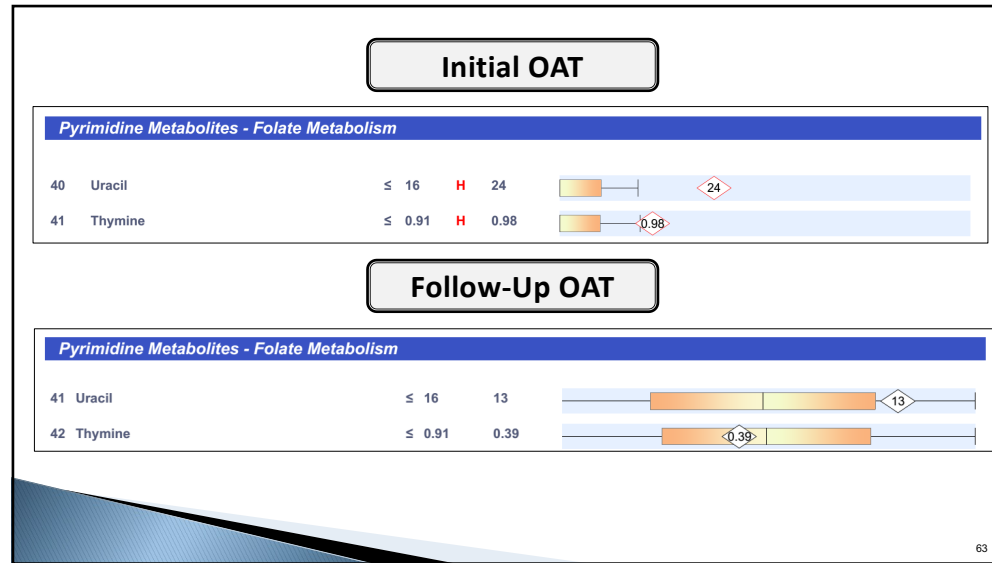
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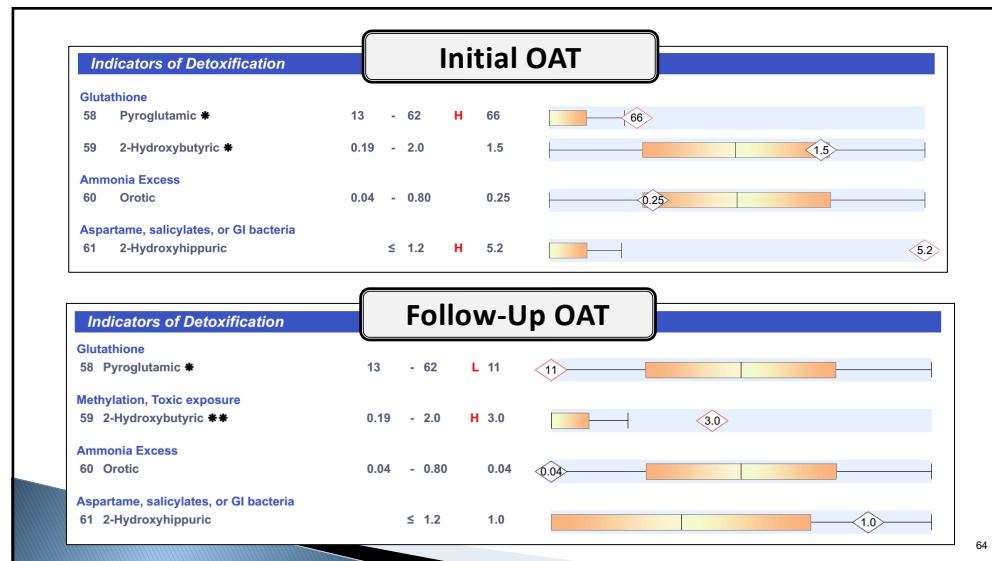
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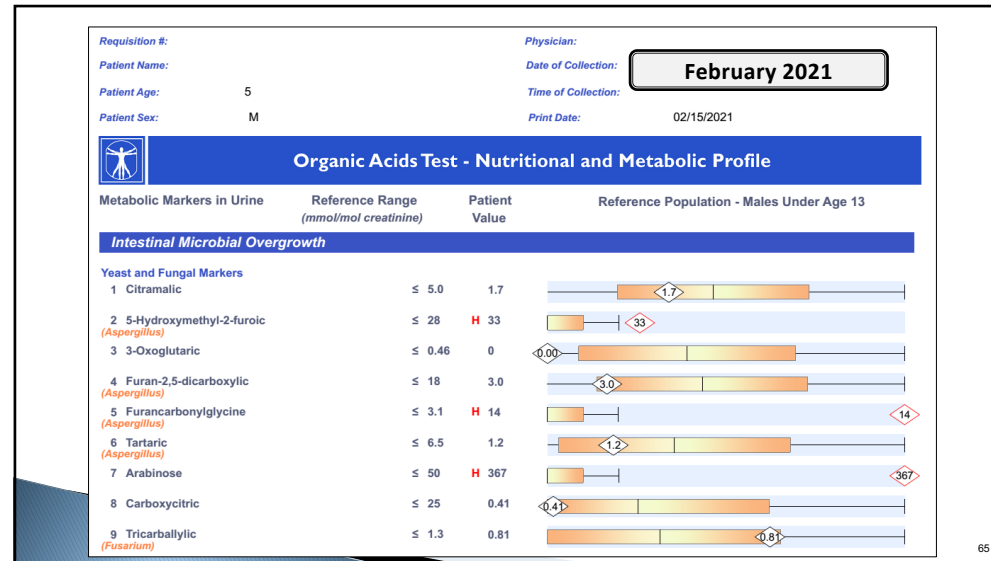
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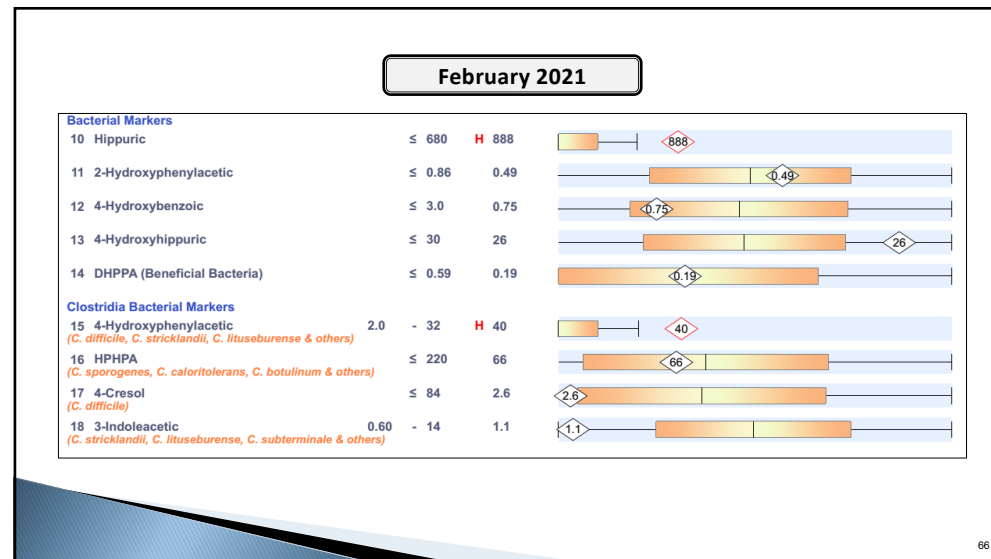
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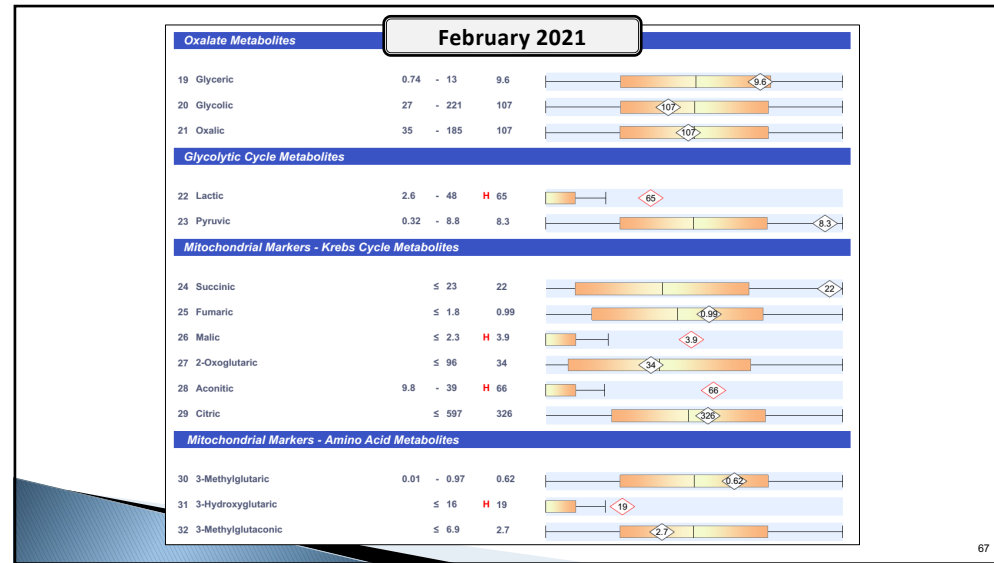
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CASE REPORT

Case study: Rapid Complete Recovery From An Autism Spectrum Disorder After Treatment of Aspergillus With The Antifungal Drugs Itraconazole And Sporanox

Sidney Baker, MD, William Shaw, PhD

Sporanox Program:
 As we know, Sporanox is an effective medication against Aspergillus mold. It is also a systemic antifungal which gets metabolized through the liver so there is always the possibility of liver stress with continued use. Up to now, _____ has done well with this medication at 150mg daily without any negative side effects. Based on the recent case study report by William Shaw, Ph.D. and Sydney Baker, M.D. (who used a maximum dose of 600mg daily) I believe increasing his dose of Sporanox could be beneficial. However, it will require monitoring of his liver enzymes through blood testing. Here are my recommendations.

- Restart Sporanox at 150mg daily for 7 days. This was the dose he was on before and he was fine with it.
- After one week back on 150mg of Sporanox, increase dose to 300mg daily. This dose is to be split up 150mg twice daily.
- After 7 days of 300mg daily dosing obtain blood test for liver enzyme function to include AST (SGOT), ALT (SGPT), GGTP (GGT) and Alkaline Phosphatase (Alk. Phos.).
- Before considering an increase in the dose from 300mg (perhaps to 450mg), we need to make sure his liver enzymes are not elevated, as well as determining how well _____ is doing on current dose of Sporanox.
- Once Sporanox starts, discontinue any Nystatin he might be taking.
- If Milan is still taking high dose Vitamin A, I would suggest discontinuing that now.

Please let me know if you have any questions. Also, keep detailed notes/observations on with regards to reintroduction of Sporanox at 150mg and the increase to 300mg.

that there are some sources of generic itraconazole lack efficacy and that a diagnostic trial of Sporanox[®] is most efficiently done with an increase to 600 mg over a period of seven to ten days.

We cite as an example, a patient whose identical twin's autism responded to treatments from the protocols of the Defeat Autism Now! consensus document to become a young man with a job. His twin suffered with severe ongoing symptoms that were only partially relieved with antifungal, and a long list of "alternative" and conventional therapies. After Baker's experience with M, he simply suggested that he take 600 mg of Brand Name itraconazole daily while monitoring his AST, ALT and GGT. His dramatic response surpassed any outcome from

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Other OAT Examples

Prioritizing Test Markers

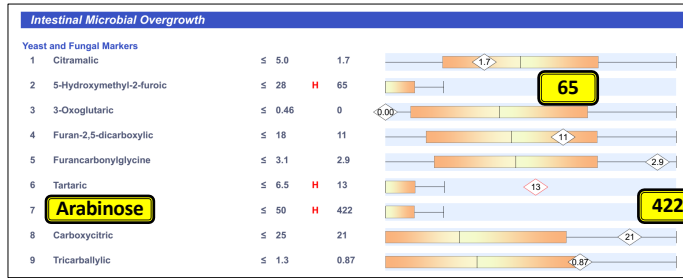
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Case Example 1

- ▶ Digestive bloating and gas
- ▶ High food intolerance
- ▶ Problems with sinus congestion and infections
- ▶ Loose stools mixed with periodic constipation
- ▶ Difficulty sleeping, poor memory, anxiety
- ▶ Fatigue, even with moderate activity
- ▶ Urinary discomfort described as burning after eating salads and certain nuts.
- ▶ Constant soreness in muscles and joints

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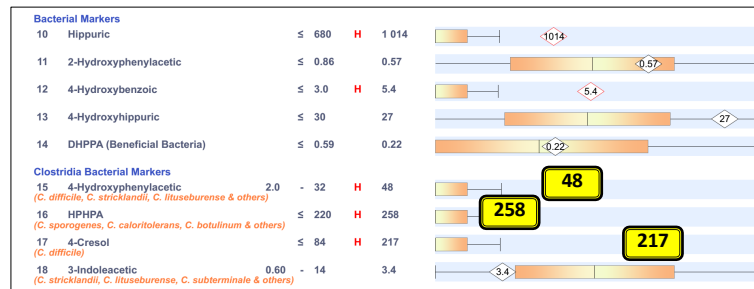
Example 1



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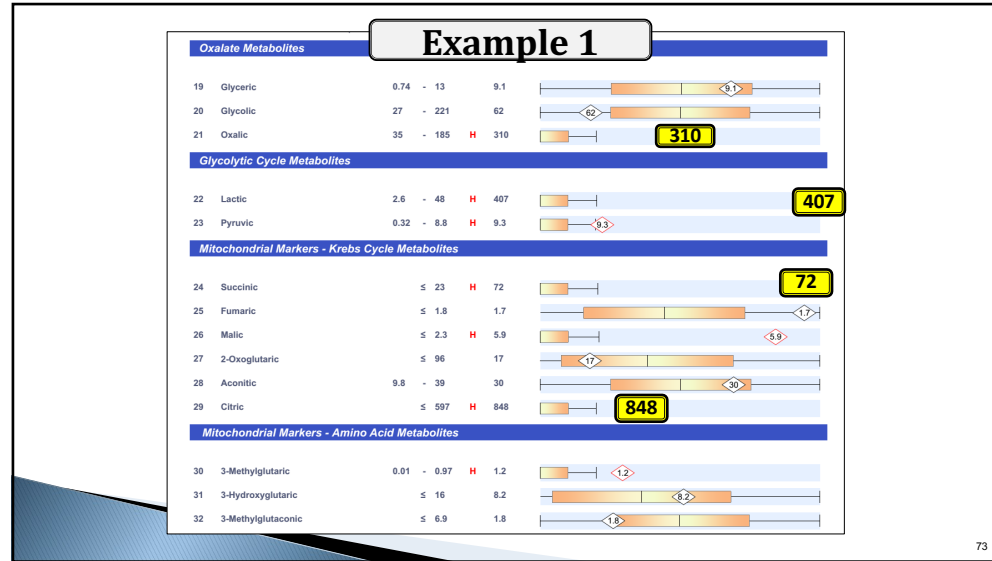
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Example 1

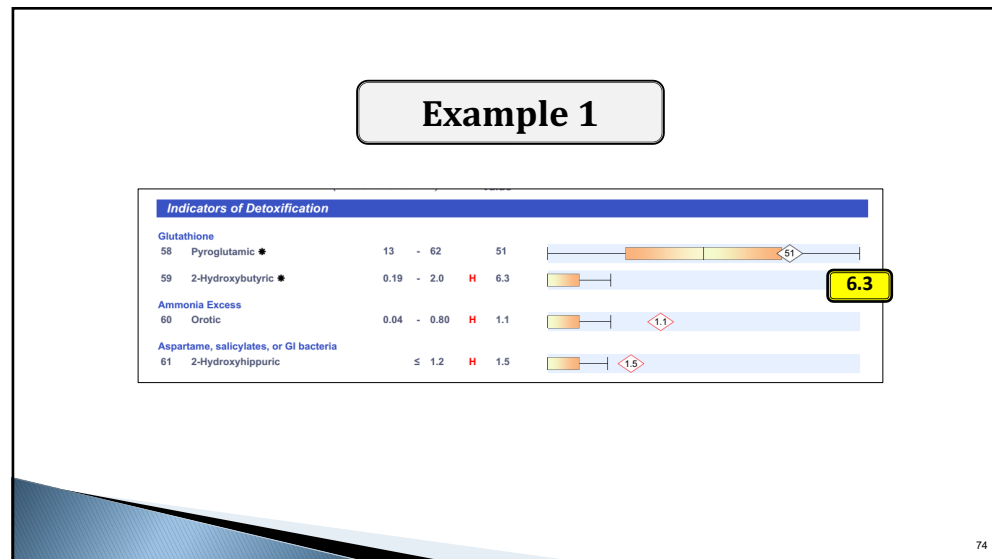


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Intervention Strategies

1. Eradicate clostridia – *high priority*
2. Lower oxalate - *high priority*
3. Treat candida – *priority*
4. Mitochondrial support – *priority*
5. Glutathione support – *priority*
6. GPL-TOX and Glyphosate tests
7. Myco-TOX Profile

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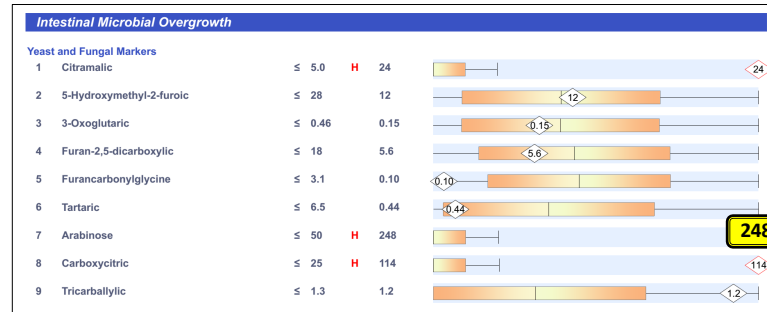
Case Example 2

- ▶ Digestive gas after high carbohydrate meal or snack
- ▶ Mild/moderate fatigue, but only after intense activity:
 - *Able to exercise, e.g., cardio, weights, 3 to 4 times weekly*
- ▶ Moodiness, easy to temper
- ▶ No depression but does feel emotionally overwhelmed much of the time. High stress job.
- ▶ No muscle or joint pain
- ▶ No urinary complaints

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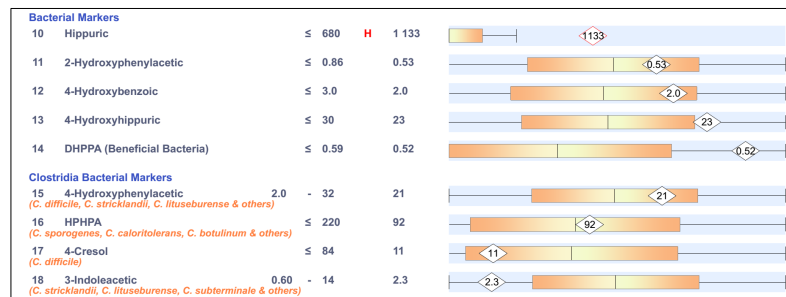
Example 2



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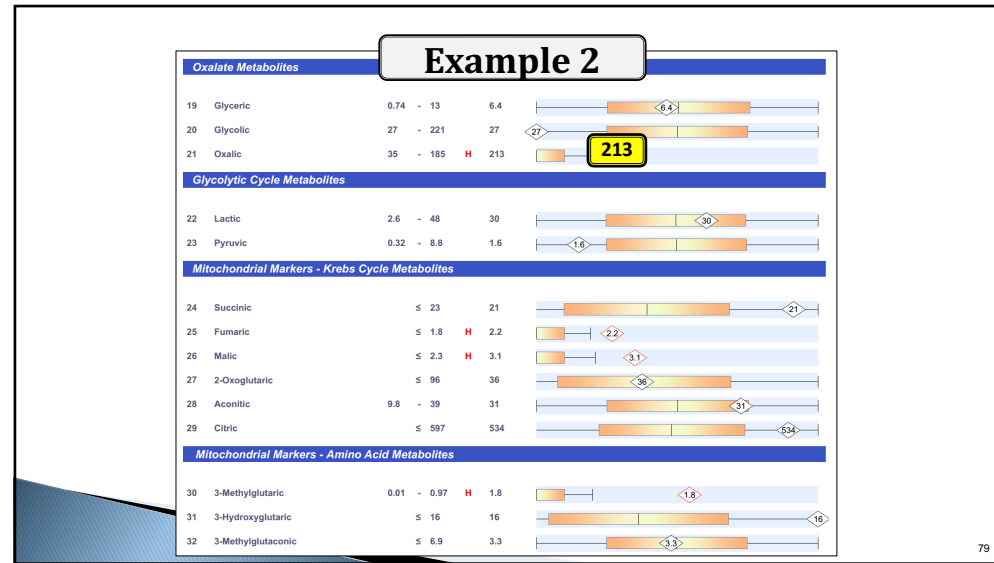
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Example 2

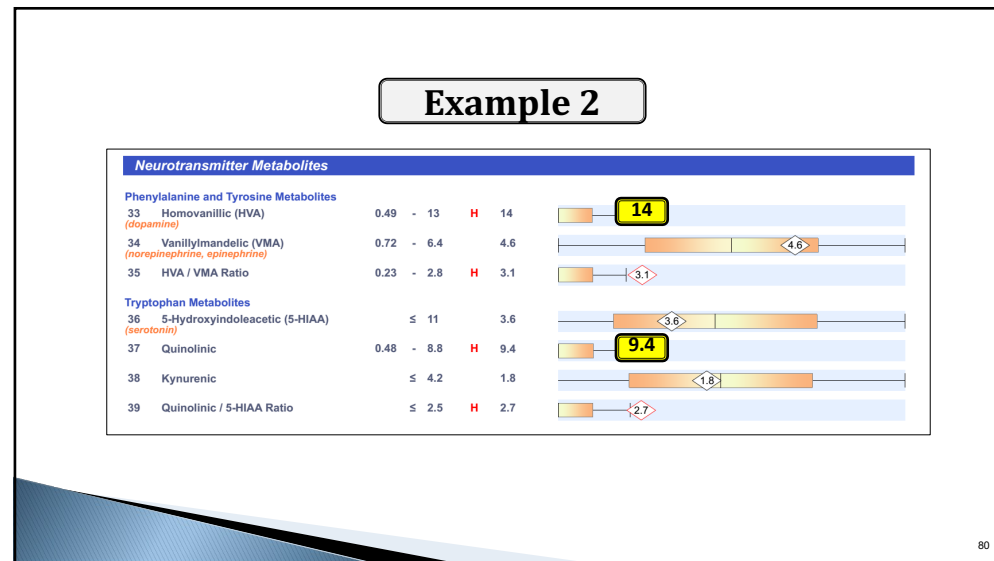


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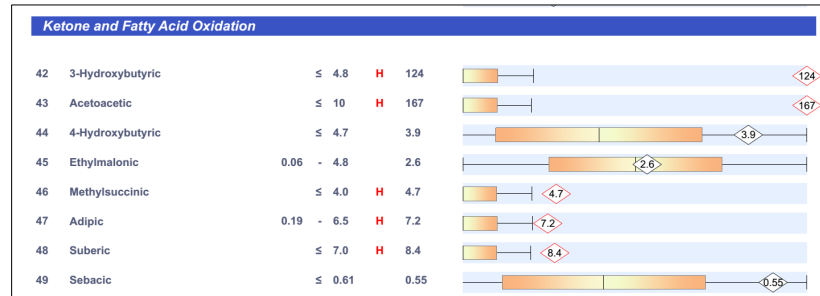


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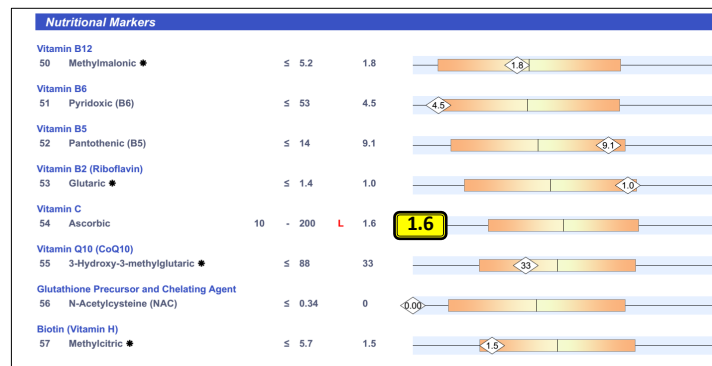
Example 2



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Example 2



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Example 2

Indicators of Detoxification					
Glutathione					
58	Pyroglutamic *	13	- 62	34	
59	2-Hydroxybutyric *	0.19	- 2.0	H 2.4	
Ammonia Excess					
60	Orotic	0.04	- 0.80	0.74	
Aspartame, salicylates, or GI bacteria					
61	2-Hydroxyhippuric	≤ 1.2	H	1.5	

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Intervention Strategies

1. Treat candida – *high priority*
2. Treat quinolinic acid – *high priority*
3. L-carnitine supplementation – *priority*
4. Mitochondrial support
5. Vitamin B6 & Vitamin C supplementation – *priority*
6. Glutathione support – *priority*
7. Lower oxalate
8. Consider GPL-TOX panel

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Case Example 3

- ▶ Chronic fatigue for years
- ▶ High food intolerance
- ▶ Chemical and perfume sensitive:
 - Will cause headaches and increased fatigue
- ▶ Bloating, gas and cramping almost continuously:
 - Much worse after carbohydrate foods and alcohol
- ▶ Depressed, high anxiety and emotional instability
- ▶ Fibromyalgia-like discomfort, constant muscle soreness
- ▶ No urinary pain or difficulties

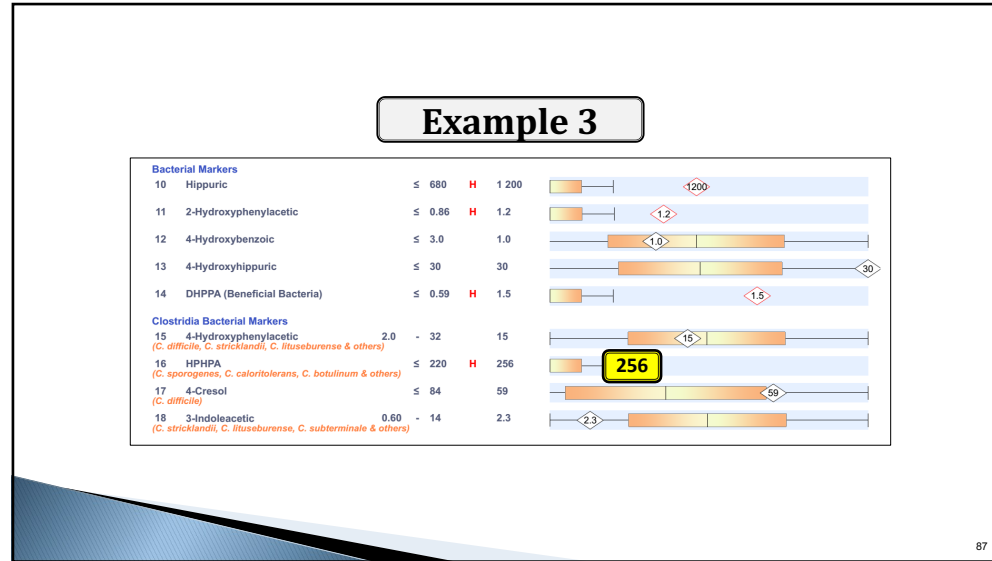
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Example 3

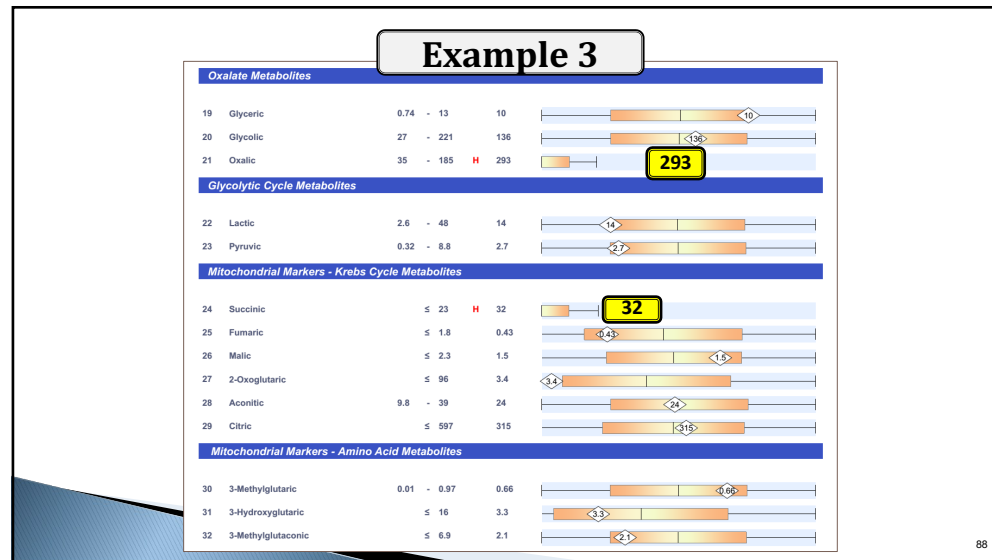
Intestinal Microbial Overgrowth

Yeast and Fungal Markers	≤			
1 Citramalic	≤ 5.0		2.1	<2.1
2 5-Hydroxymethyl-2-furoic	≤ 28	H	334	334
3 3-Oxoglutaric	≤ 0.46		0.02	<0.02
4 Furan-2,5-dicarboxylic	≤ 18	H	137	137
5 Furancarboxylglycine	≤ 3.1		0.24	<0.24
6 Tartaric	≤ 6.5	H	240	<240
7 Arabinose	≤ 50	H	208	208
8 Carboxycitric	≤ 25		0.58	<0.58
9 Tricarballic	≤ 1.3	H	2.8	<2.8

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Example 3

Indicators of Detoxification					
Glutathione					
58	Pyroglutamic *	13	- 62	46	
59	2-Hydroxybutyric *	0.19	- 2.0	1.1	
Ammonia Excess					
60	Orotic	0.04	- 0.80	0.45	
Aspartame, salicylates, or GI bacteria					
61	2-Hydroxyhippuric	≤ 1.2	H	2.6	

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Intervention Strategies

1. Eradicate clostridia – *high priority*
2. Treat candida – *high priority*
3. Lower oxalate – *high priority*
4. Mitochondrial support – *priority*
5. GPL-TOX and Glyphosate tests
6. Myco-TOX Profile – *high priority*

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Combining Different Integrative Medicine Testing

*The role of the Organic Acids Test with other
common Integrative Medicine assessments*

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Schizophrenia

Diagnosis: Schizophrenia, depression

Age: 23-year old man

History:

- ▶ Sudden onset of paranoia about strangers, customers at work.
- ▶ Previous 3 months – not sleeping well, poor concentration, low self-esteem, anxious:
 - *Father mentioned problems really began in late high school*
- ▶ Family history of schizophrenia

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Schizophrenia

Medical Treatment:

- ▶ **Risperidone** – was not able to tolerate because of memory issues. However, it did help eliminate the acute onset of paranoia.

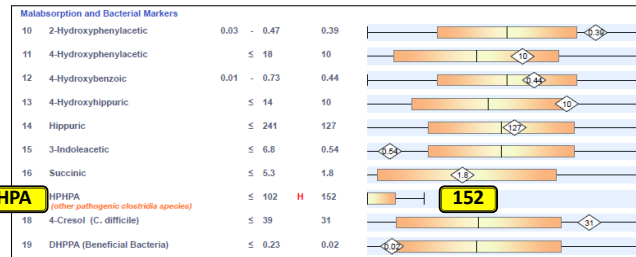
Supplements:

- *Niacin - 200mg BID*
- *Astaxanthin – 6mg BID (carotenoid/antioxidant)*
- *Krill Oil – 500mg BID*

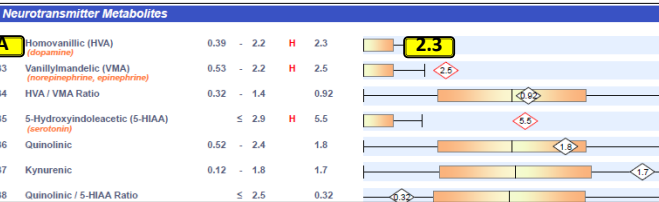
- ▶ **Lab Testing** – all deemed normal

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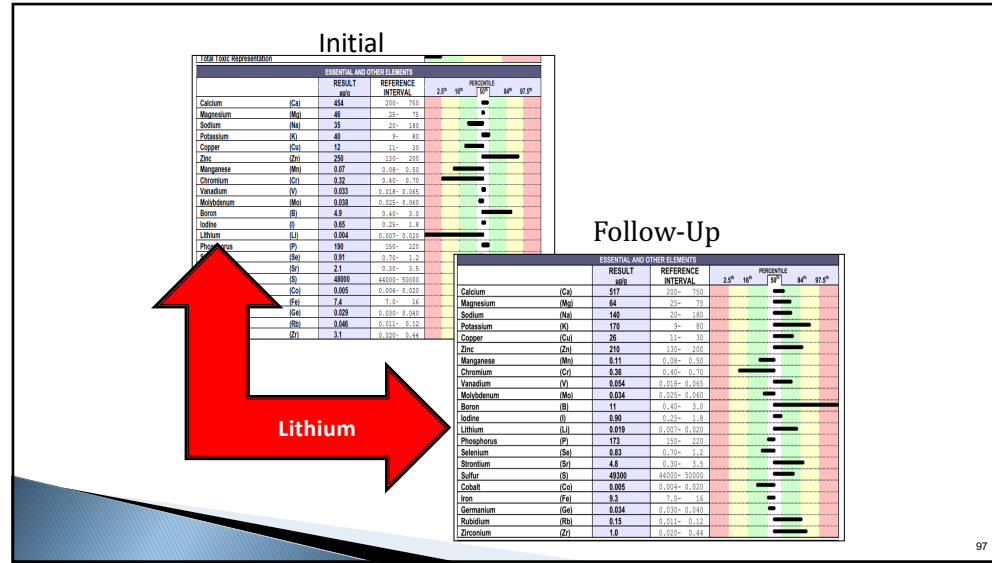
HPHPA



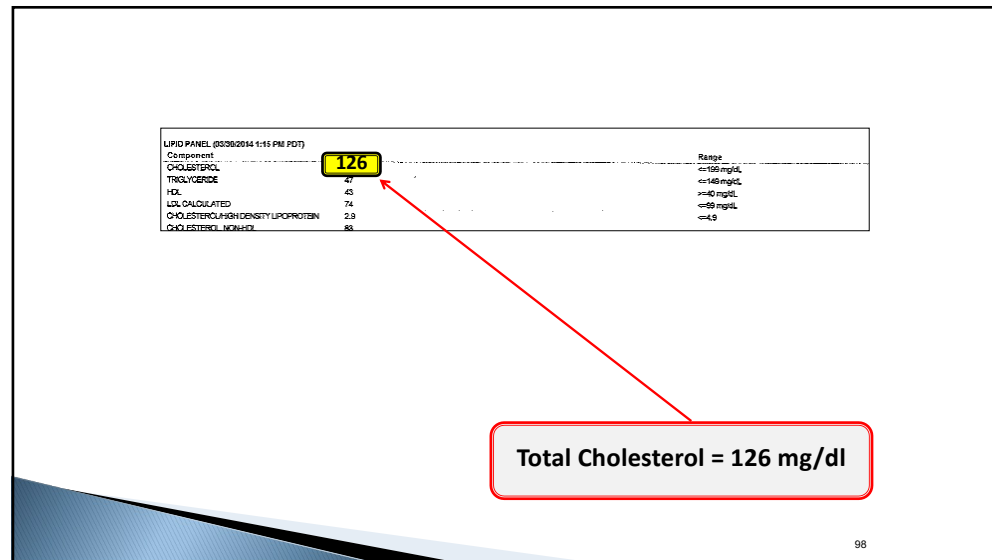
HVA

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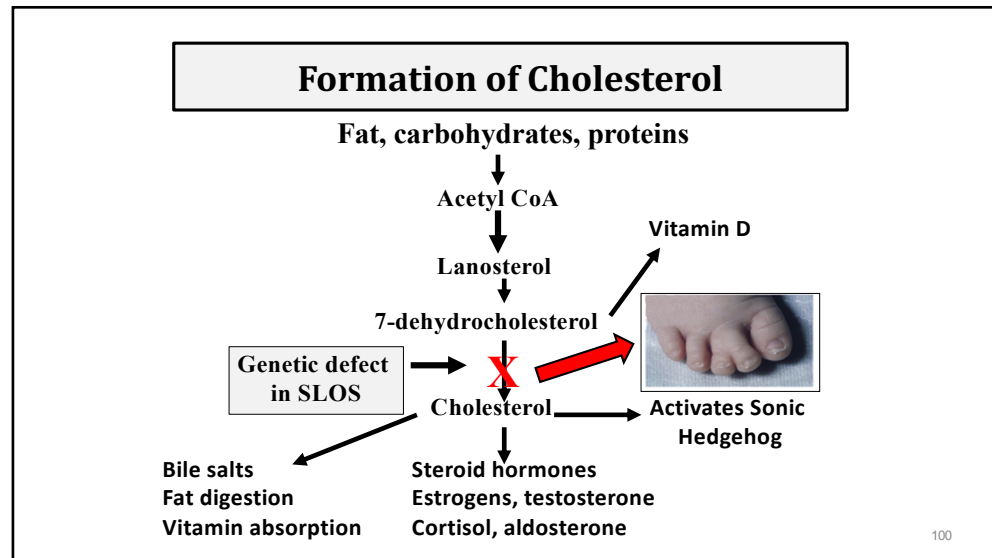
Elaine Tierney et al. "Abnormalities of cholesterol metabolism in autism - spectrum disorders." Am J of Med Genetics Part B: Neuropsychiatric Genetics. Vol 141B, Issue 6, Pages 666 - 668,2006

- ▶ Using gas chromatography/mass spectrometry, cholesterol was quantified in 100 samples from subjects with ASD obtained from the Autism Genetic Resource Exchange (AGRE) specimen repository.
- ▶ Although no sample had cholesterol levels consistent with SLOS, 19 samples (19%) had total cholesterol levels lower than 100 mg/dl, which is below the 5th percentile for children over age 2 years.

NIH meta-analysis indicates less than 160mg/dl of cholesterol = 10 to 20% increased death rate. Also, low values (below 160) seem to be associated with depression, anxiety, bipolar, cancer, Parkinson's, violent behavior and behavioral volatility.

- ▶ These findings suggest that, in addition to SLOS, there may be other disorders of sterol metabolism or homeostasis associated with ASD.

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Sonic Cholesterol

- ▶ Highly purified cholesterol with no detectable toxic metals or environmental chemicals.
- ▶ Useful for people with low cholesterol who have egg allergies.
- ▶ Useful for people who don't eat brain or liver.
- ▶ 1 capsule equals approximately 250mg of pure cholesterol.



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GetSonicCholesterol.com

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Low Cholesterol Can be as
Dangerous as High Cholesterol

Raise Your Cholesterol to
Healthy Levels With Sonic Cholesterol



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Various Treatments

- ▶ Dairy elimination
- ▶ Botanicals for *clostridia*
- ▶ Adrenal support, e.g., pregnenolone, hydrocortisone, botanicals.
- ▶ Lithium Orotate
- ▶ Sonic Cholesterol
- ▶ Lifestyle changes, e.g., sleep, exercise, stress management, protein shakes.

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Kurt N. Woeller, D.O.



**Thank
You**

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