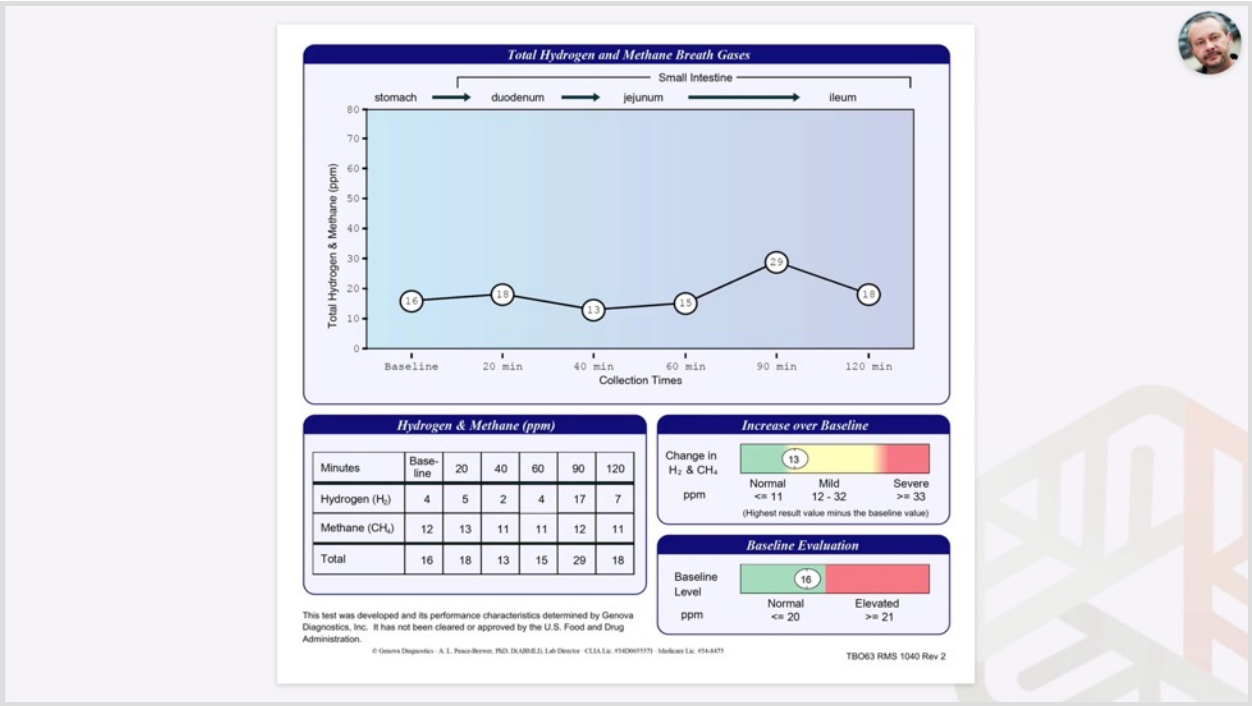
KRESSER INSTITUTE
FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

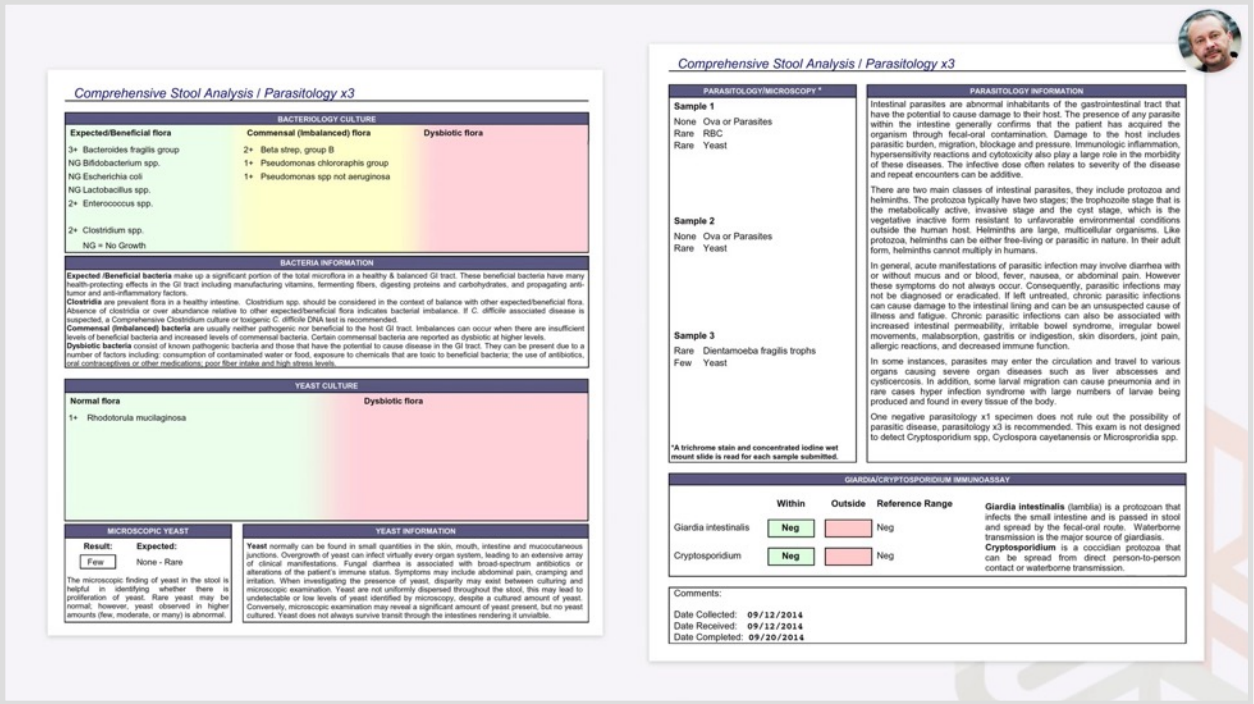
Gut Case Studies - Part 2

CASE #3: 41-YEAR-OLD MALE

Next patient is a 41-year-old male. His chief complaint was very high cholesterol, and he didn't feel unwell, he just wanted to optimize mental and physical performance and maybe lean out a little bit. He did have some occasional post-nasal drip, occasional insomnia that seemed mostly lifestyle related, and occasional fatigue that was mostly related to the insomnia. This was clearly connected to what was going on in his life; he's a high-powered CEO of a very well-known tech corporation and was burning the candle at both ends, as is often the case with people in that position.



So here were his SIBO and breath test results. Interestingly enough, he was positive for methane even though he didn't really have any digestive symptoms to complain of. If we use the Pimentel criteria, he was positive because it should be below three parts per million and he was at 12 baseline and at 13 when 20 minutes into the test. Pretty mild though, and nothing going on in the hydrogen category. Definitely with a borderline result like this and lack of gut symptoms, it's not entirely clear if this would be contributing to his other issues. You'd have to look at the rest of the gut testing, which we're about to do.



Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
3+ Bacteroides fragilis group	2+ Beta strep, group B	
NG Bifidobacterium spp.	1+ Pseudomonas chlororaphis group	
NG Escherichia coli	1+ Pseudomonas spp not aeruginosa	
NG Lactobacillus spp.		
2+ Enterococcus spp.		
2+ Clostridium spp.		
NG = No Growth		

BACTERIA INFORMATION

Expected /Beneficial bacteria make up a significant portion of the total microflora in a healthy & balanced GI tract. These beneficial bacteria have many health-protecting effects in the GI tract including manufacturing vitamins, fermenting fibers, digesting proteins and carbohydrates, and propagating anti-tumor and anti-inflammatory factors.
Clostridia are prevalent flora in a healthy intestine. Clostridium spp. should be considered in the context of balance with other expected/beneficial flora. Absence of clostridia or over abundance relative to other expected/beneficial flora indicates bacterial imbalance. If C. difficile associated disease is suspected, a Comprehensive Clostridium culture or toxigenic C. difficile DNA test is recommended.
Commensal (imbalanced) bacteria are usually neither pathogenic nor beneficial to the host GI tract. Imbalances can occur when there are insufficient levels of beneficial bacteria and increased levels of commensal bacteria. Certain commensal bacteria are reported as dysbiotic at higher levels.
Dysbiotic bacteria consist of known pathogenic bacteria and those that have the potential to cause disease in the GI tract. They can be present due to a number of factors including: consumption of contaminated water or food, exposure to chemicals that are toxic to beneficial bacteria; the use of antibiotics, oral contraceptives or other medications, poor fiber intake and high stress levels.

YEAST CULTURE

Normal flora	Dysbiotic flora
1+ Rhodotorula mucilaginosa	

MICROSCOPIC YEAST

Result:	Expected:
Few	None - Rare

The microscopic finding of yeast in the stool is helpful in identifying whether there is proliferation of yeast. Rare yeast may be normal; however, yeast observed in higher amounts (few, moderate, or many) is abnormal.

YEAST INFORMATION

Yeast normally can be found in small quantities in the skin, mouth, intestine and mucocutaneous junctions. Overgrowth of yeast can infect virtually every organ system, leading to an extensive array of clinical manifestations. Fungal diarrhea is associated with broad-spectrum antibiotics or alterations of the patient's immune status. Symptoms may include abdominal pain, cramping and irritation. When investigating the presence of yeast, disparity may exist between culturing and microscopic examination. Yeast are not uniformly dispersed throughout the stool, this may lead to undetectable or low levels of yeast identified by microscopy, despite a cultured amount of yeast. Conversely, microscopic examination may reveal a significant amount of yeast present, but no yeast cultured. Yeast does not always survive transit through the intestines rendering it unviable.

Comprehensive Stool Analysis / Parasitology x3

PARASITOLOGY/MICROSCOPY *	PARASITOLOGY INFORMATION
Sample 1 None Ova or Parasites Rare RBC Rare Yeast **Sample 2** None Ova or Parasites Rare Yeast **Sample 3** Rare Dientamoeba fragilis trophs Few Yeast *A trichrome stain and concentrated iodine wet mount slide is read for each sample submitted.	Intestinal parasites are abnormal inhabitants of the gastrointestinal tract that have the potential to cause damage to their host. The presence of any parasite within the intestine generally confirms that the patient has acquired the organism through fecal-oral contamination. Damage to the host includes parasitic burden, migration, blockage and pressure. Immunologic inflammation, hypersensitivity reactions and cytotoxicity also play a large role in the morbidity of these diseases. The infective dose often relates to severity of the disease and repeat encounters can be additive. There are two main classes of intestinal parasites, they include protozoa and helminths. The protozoa typically have two stages; the trophozoite stage that is the metabolically active, invasive stage and the cyst stage, which is the vegetative inactive form resistant to unfavorable environmental conditions outside the human host. Helminths are large, multicellular organisms. Like protozoa, helminths can be either free-living or parasitic in nature. In their adult form, helminths cannot multiply in humans. In general, acute manifestations of parasitic infection may involve diarrhea with or without mucus and or blood, fever, nausea, or abdominal pain. However these symptoms do not always occur. Consequently, parasitic infections may not be diagnosed or eradicated. If left untreated, chronic parasitic infections can cause damage to the intestinal lining and can be an unsuspected cause of illness and fatigue. Chronic parasitic infections can also be associated with increased intestinal permeability, irritable bowel syndrome, irregular bowel movements, malabsorption, gastritis or indigestion, skin disorders, joint pain, allergic reactions, and decreased immune function. In some instances, parasites may enter the circulation and travel to various organs causing severe organ diseases such as liver abscesses and cysticercosis. In addition, some larval migration can cause pneumonia and in rare cases hyper infection syndrome with large numbers of larvae being produced and found in every tissue of the body. One negative parasitology x1 specimen does not rule out the possibility of parasitic disease, parasitology x3 is recommended. This exam is not designed to detect Cryptosporidium spp, Cyclospora cayetanensis or Microsporidia spp.

GIARDIA/CRYPTOSPORIDIUM IMMUNOASSAY

	Within	Outside	Reference Range
Giardia intestinalis	Neg		Neg
Cryptosporidium	Neg		Neg

Giardia intestinalis (lamblia) is a protozoan that infects the small intestine and is passed in stool and spread by the fecal-oral route. Waterborne transmission is the major source of giardiasis. **Cryptosporidium** is a coccidian protozoa that can be spread from direct person-to-person contact or waterborne transmission.

Comments:

Date Collected: 09/12/2014
Date Received: 09/12/2014
Date Completed: 09/20/2014

So the Doctor's Data stool test showed pretty significant dysbiosis. They weren't able to grow any Bifidobacterium, beneficial E. coli or Lactobacillus in his stool, and he did have some mild fungal overgrowth with "few" on the microscopic yeast exam, and then he had Dientamoeba fragilis in one of the stool specimens. As you'll recall, that's similar to Blastocystis hominis. Its pathogenicity has been somewhat controversial over time.

Comprehensive Stool Analysis / Parasitology x3

DIGESTION /ABSORPTION

	Within	Outside	Reference Range
Elastase	325		> 200 µg/mL
Fat Stain	Few		None - Mod
Muscle fibers	Rare		None - Rare
Vegetable fibers	Rare		None - Few
Carbohydrates	Neg		Neg

Elastase findings can be used for the diagnosis or the exclusion of exocrine pancreatic insufficiency. Correlations between low levels and chronic pancreatitis and cancer have been reported. **Fat Stain:** Microscopic determination of fecal fat using Sudan IV staining is a qualitative procedure utilized to assess fat absorption and to detect steatorrhea. **Muscle fibers** in the stool are an indicator of incomplete digestion. Bloating, flatulence, feelings of "fullness" may be associated with increase in muscle fibers. **Vegetable fibers** in the stool may be indicative of inadequate chewing, or eating "on the run". **Carbohydrates:** The presence of reducing substances in stool specimens can indicate carbohydrate malabsorption.

INFLAMMATION

	Within	Outside	Reference Range
Lysozyme*	542		<= 600 ng/mL
Lactoferrin	< 0.5		< 7.3 µg/mL
White Blood Cells	None		None - Rare
Mucus	Neg		Neg

Lysozyme* is an enzyme secreted at the site of inflammation in the GI tract and elevated levels have been identified in IBD patients. **Lactoferrin** is a quantitative GI specific marker of inflammation used to diagnose and differentiate IBD from IBS and to monitor patient inflammation levels during active and remission phases of IBD. **White Blood Cells** (WBC): in the stool are an indication of an inflammatory process resulting in the infiltration of leukocytes within the intestinal lumen. WBCs are often accompanied by mucus and blood in the stool. **Mucus** in the stool may result from prolonged mucosal irritation or in a response to parasympathetic excitability such as spastic constipation or mucous colitis.

IMMUNOLOGY

	Within	Outside	Reference Range
Secretory IgA*	80.3		51 - 204mg/dL

Secretory IgA* (sIgA) is secreted by mucosal tissue and represents the first line of defense of the GI mucosa and is central to the normal function of the GI tract as an immune barrier. Elevated levels of sIgA have been associated with an upregulated immune response.

Comments:

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*For Research Use Only. Not for use in diagnostic procedures.

Comprehensive Stool Analysis / Parasitology x3

SHORT CHAIN FATTY ACIDS

	Within	Outside	Reference Range
% Acetate	65		40 - 75 %
% Propionate	17		9 - 29 %
% Butyrate	16		9 - 37 %
% Valerate	1.7		0.5 - 7 %
Butyrate	1.7		0.8 - 4.8 mg/mL
Total SCFA's	11		4 - 18 mg/mL

Short chain fatty acids (SCFAs): SCFAs are the end product of the bacterial fermentation process of dietary fiber by beneficial flora in the gut and play an important role in the health of the GI as well as protecting against intestinal dysbiosis. Lactobacilli and bifidobacteria produce large amounts of short chain fatty acids, which decrease the pH of the intestines and therefore make the environment unsuitable for pathogens, including bacteria and yeast. Studies have shown that SCFAs have numerous implications in maintaining gut physiology. SCFAs decrease inflammation, stimulate healing, and contribute to normal cell metabolism and differentiation. Levels of **Butyrate** and **Total SCFA** in mg/mL are important for assessing overall SCFA production, and are reflective of beneficial flora levels and/or adequate fiber intake.

INTESTINAL HEALTH MARKERS

	Within	Outside	Reference Range
Red Blood Cells	Rare		None - Rare
pH	6.1		6 - 7.8
Occult Blood	Neg		Neg

Red Blood Cells (RBC) in the stool may be associated with a parasitic or bacterial infection, or an inflammatory bowel condition such as ulcerative colitis, Colorectal cancer, anal fistulas, and hemorrhoids should also be ruled out.
pH: Fecal pH is largely dependent on the fermentation of fiber by the beneficial flora of the gut.
Occult blood: A positive occult blood indicates the presence of free hemoglobin found in the stool, which is released when red blood cells are lysed.

MACROSCOPIC APPEARANCE

	Appearance	Expected
Color	Brown	Brown
Consistency	Soft	Formed/Soft

Color: Stool is normally brown because of pigments formed by bacteria acting on bile introduced into the digestive system from the liver. While certain conditions can cause changes in stool color, many changes are harmless and are caused by pigments in foods or dietary supplements. **Consistency:** Stool normally contains about 75% water and ideally should be formed and soft. Stool consistency can vary based upon transit time and water absorption.

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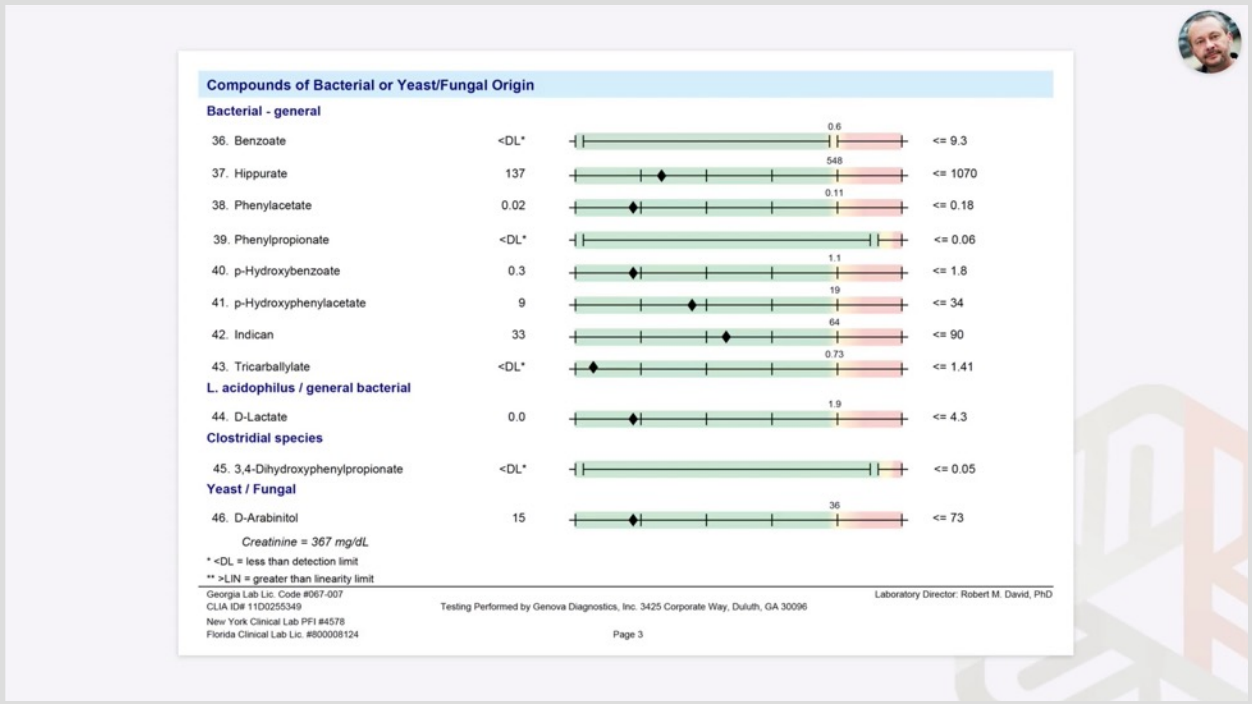
Here's the next couple pages; nothing really happening in digestion or inflammation or immunology sections, or in short-chain fatty acids or intestinal health.



Compounds of Bacterial or Yeast/Fungal Origin

Bacterial - general			
36. Benzoate	<DL*	0.6	<= 9.3
37. Hippurate	137	548	<= 1070
38. Phenylacetate	0.02	0.11	<= 0.18
39. Phenylpropionate	<DL*		<= 0.06
40. p-Hydroxybenzoate	0.3	1.1	<= 1.8
41. p-Hydroxyphenylacetate	9	19	<= 34
42. Indican	33	64	<= 90
43. Tricarballylate	<DL*	0.73	<= 1.41
L. acidophilus / general bacterial			
44. D-Lactate	0.0	1.9	<= 4.3
Clostridial species			
45. 3,4-Dihydroxyphenylpropionate	<DL*		<= 0.05
Yeast / Fungal			
46. D-Arabinitol	15	36	<= 73

Creatinine = 367 mg/dL

* <DL = less than detection limit
** >LIN = greater than linearity limit

Georgia Lab Lic. Code #067-007
CLIA ID# 11D0255349
New York Clinical Lab PFI #4578
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Testing Performed by Genova Diagnostics, Inc. 3425 Corporate Way, Duluth, GA 30096

Laboratory Director: Robert M. David, PhD

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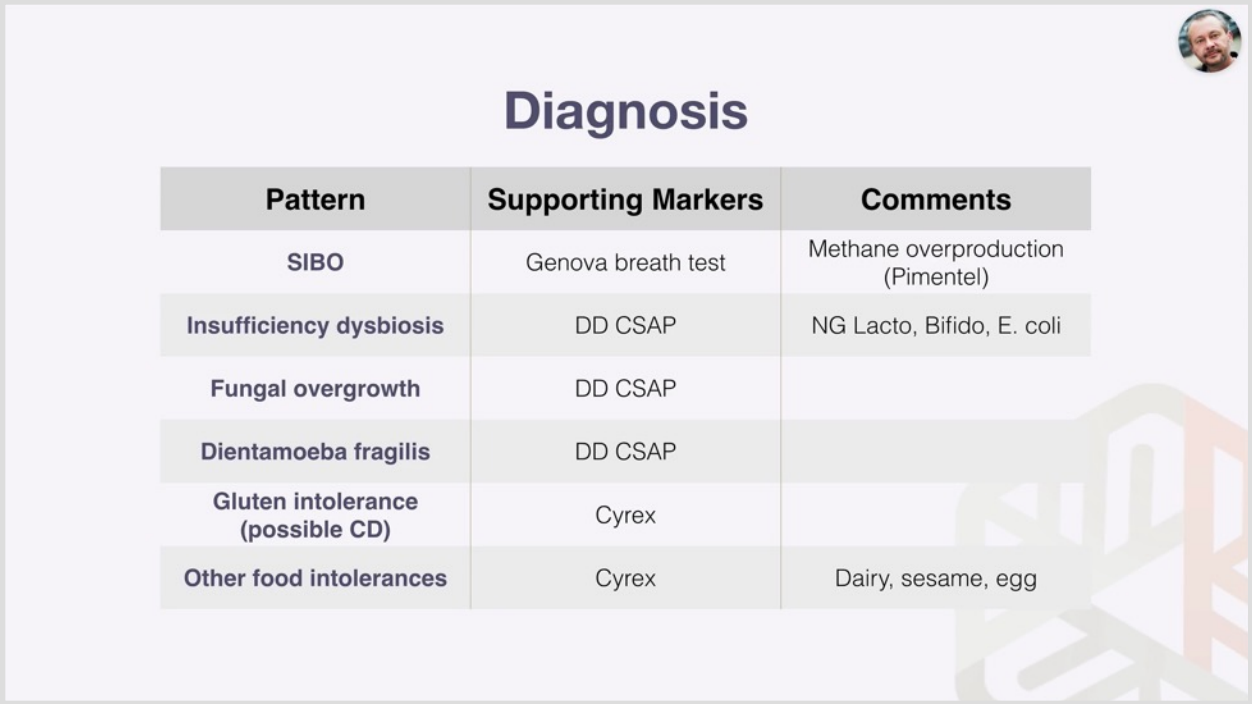
And here is his urine organic acids, totally normal. I didn't have a BioHealth 401 for this patient. This was before we were doing the Doctor's Data and BioHealth tests side by side.

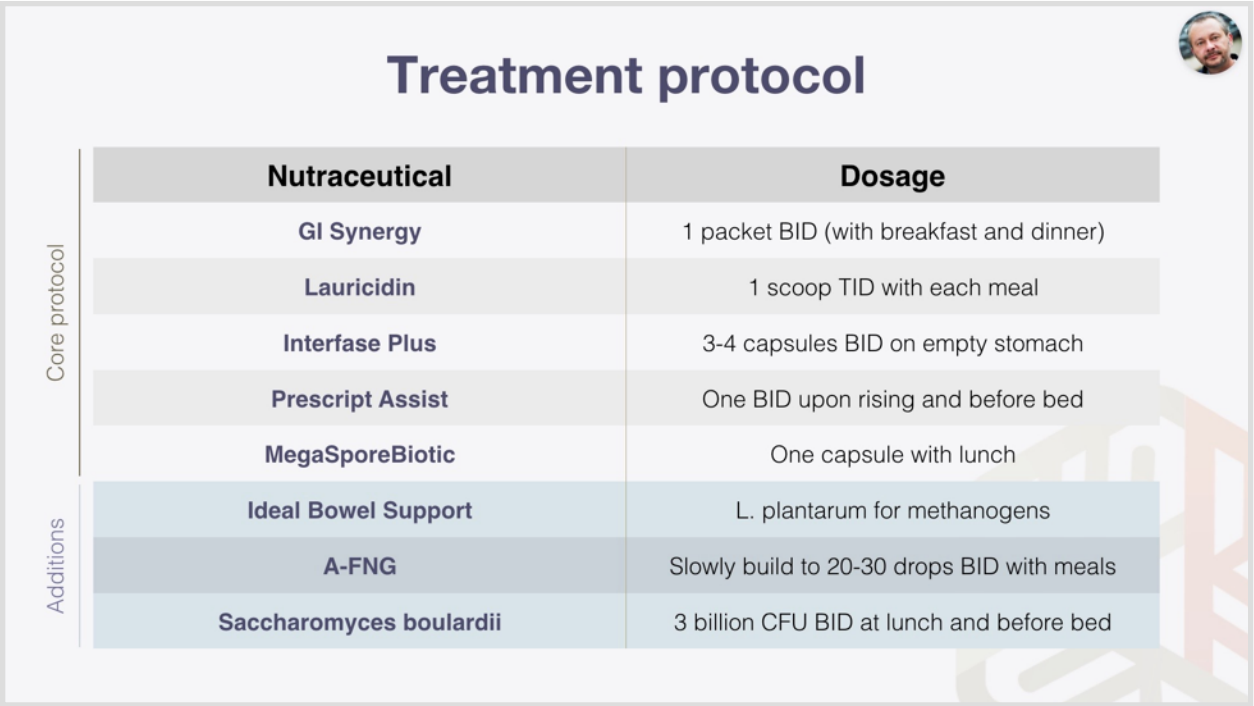
TEST	RESULT			
Array 3 – Wheat/Gluten Proteome Reactivity & Autoimmunity	IN RANGE (Normal)	EQUIVOCAL*	OUT OF RANGE	REFERENCE (ELISA Index)
Wheat IgG	0.47			0.3-1.5
Wheat IgA		1.09		0.1-1.2
Wheat Germ Agglutinin IgG	0.47			0.4-1.3
Wheat Germ Agglutinin IgA	0.65			0.2-1.1
Native & Deamidated Gliadin 33 IgG	0.49			0.2-1.2
Native & Deamidated Gliadin 33 IgA			1.52	0.1-1.1
Alpha Gliadin 17-mer IgG	0.65			0.1-1.5
Alpha Gliadin 17-mer IgA			1.60	0.1-1.1
Gamma Gliadin 15-mer IgG	0.52			0.5-1.5
Gamma Gliadin 15-mer IgA			1.17	0.1-1.0
Omega Gliadin 17-mer IgG	0.51			0.3-1.2
Omega Gliadin 17-mer IgA	0.50			0.1-1.2
Glutenin 21-mer IgG	0.61			0.1-1.5
Glutenin 21-mer IgA	0.62			0.1-1.3
Gluteomorphin + Prodynorphin IgG	0.83			0.3-1.2
Gluteomorphin + Prodynorphin IgA	0.44			0.1-1.2
Gliadin-Transglutaminase Complex IgG	0.59			0.3-1.4
Gliadin-Transglutaminase Complex IgA		1.21		0.2-1.5
Transglutaminase-2 IgG	0.84			0.3-1.6
Transglutaminase-2 IgA	0.72			0.1-1.6
Transglutaminase-3 IgG	1.00			0.2-1.6
Transglutaminase-3 IgA	0.72			0.1-1.5
Transglutaminase-6 IgG	0.45			0.2-1.5
Transglutaminase-6 IgA	1.04			0.1-1.5

TEST	RESULT			
Array 4 – Gluten-Associated Cross-Reactive Foods and Foods Sensitivity **	IN RANGE (Normal)	EQUIVOCAL*	OUT OF RANGE	REFERENCE (ELISA Index)
Rye, Barley, Spelt, Polish Wheat	0.66			0.4-1.4
Cow's Milk		1.08		0.1-1.3
Casein (Alpha & Beta)		1.46		0.1-1.7
Casomorphin	0.75			0.2-1.6
Milk Butyrophilin	0.94			0.2-1.8
Whey Protein	0.68			0.1-1.3
Chocolate (Milk)		1.39		0.1-1.4
Oats	0.42			0.2-1.0
Yeast	0.52			0.2-1.2
Coffee	1.49			0.3-1.9
Sesame			1.76	0.1-1.3
Buckwheat	0.80			0.4-1.3
Sorghum	0.83			0.3-1.2
Millet	0.92			0.3-1.5
Hemp	0.74			0.3-1.5
Amaranth	0.44			0.2-1.3
Quinoa	0.66			0.5-1.5
Tapioca	0.38			0.1-1.1
Teff	0.79			0.2-1.1
Soy	0.64			0.5-1.5
Egg		1.39		0.2-1.7
Corn	0.87			0.3-1.4
Rice	0.51			0.4-1.6
Potato	<0.60			0.6-1.4

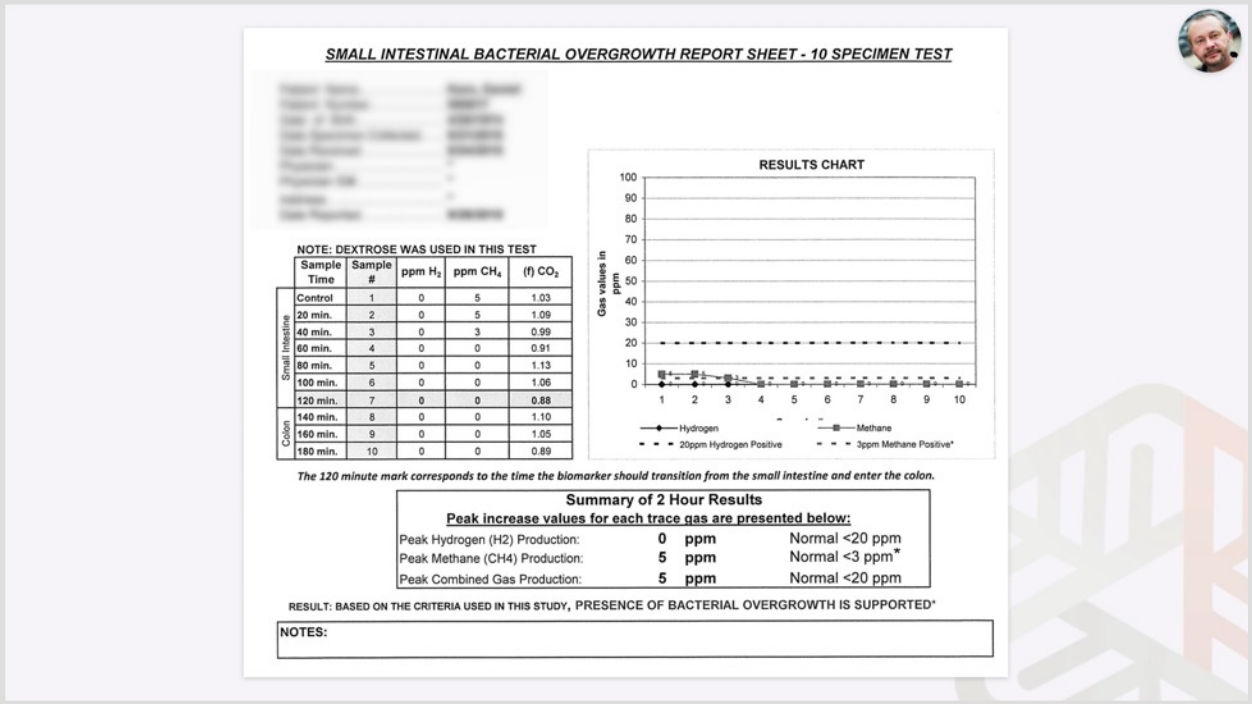
So here's a Cyrex Array 3 and Array 4 for him. He wasn't eating a lot of gluten, but he was still eating it occasionally when he traveled and ate out, so he wanted to really find out whether it was a problem for him, and sure enough it was. You can see he's got IgA antibodies to native and deamidated gliadin, and IgA antibodies to alpha-gliadin, and IgA antibodies to gamma-gliadin, and then also IgA antibodies to gliadin transglutaminase complex, and IgA antibodies to wheat. So interestingly enough, this patient's producing exclusively IgA antibodies rather than IgG. So what you could expect given that the native and deamidated gliadin antibodies and alpha-gliadin antibodies and the gliadin transglutaminase complex, I suspected celiac, and so the patient agreed to completely cut out gluten. He didn't really see the need for getting a follow-up, further testing for celiac, because he was fine with just completely removing wheat and any of the other potential cross-reactive proteins. On Array 4, he tested positive for dairy, cow's milk, casein, and chocolate milk, and then sesame and egg, and so he removed those from his diet as well.



So here's the diagnosis: SIBO, borderline, again pathogenicity unclear, insufficiency dysbiosis on the Doctor's Data stool panel along with fungal overgrowth and Dientamoeba fragilis. Gluten intolerance and possible celiac, and some other food intolerances on the Cyrex panel.



So I decided to do an antimicrobial protocol based on the borderline SIBO, the D. fragilis, and the fungal overgrowth. If it was just insufficiency dysbiosis, I probably wouldn't have done antimicrobials; I would have gone right to prebiotics and probiotics to rebuild, but in this case, because of the SIBO, D. fragilis and the fungal overgrowth, I decided to do 30 days of the antimicrobial protocol. And his main complaint was high cholesterol; if you've been through the high cholesterol action plan, you'll know that gut issues can actually be a major contributor to high cholesterol, and he wanted to approach high cholesterol from a functional perspective instead of just taking statins, so he was motivated to address some of these underlying causes to see if that brought down his cholesterol levels. I added a few things based on his presentation: Ideal Bowel Support, which is Lactobacillus plantarum, which degrades methane, because he had primarily elevated methane—he didn't want to do pharmaceuticals to begin with so we started here—A-FNG for the fungal overgrowth; and Saccharomyces boulardii for the fungal overgrowth and also for the D. fragilis. As you know from the treatment protocol section, Saccharomyces boulardii can be a helpful antiparasitic agent.



SMALL INTESTINAL BACTERIAL OVERGROWTH REPORT SHEET - 10 SPECIMEN TEST

[redacted]

NOTE: DEXTROSE WAS USED IN THIS TEST

	Sample Time	Sample #	ppm H_2	ppm CH_4	(f) CO_2
Small Intestine	Control	1	0	5	1.03
	20 min.	2	0	5	1.09
	40 min.	3	0	3	0.99
	60 min.	4	0	0	0.91
	80 min.	5	0	0	1.13
	100 min.	6	0	0	1.06
	120 min.	7	0	0	0.88
Colon	140 min.	8	0	0	1.10
	160 min.	9	0	0	1.05
	180 min.	10	0	0	0.89

RESULTS CHART

The 120 minute mark corresponds to the time the biomarker should transition from the small intestine and enter the colon.

Summary of 2 Hour Results

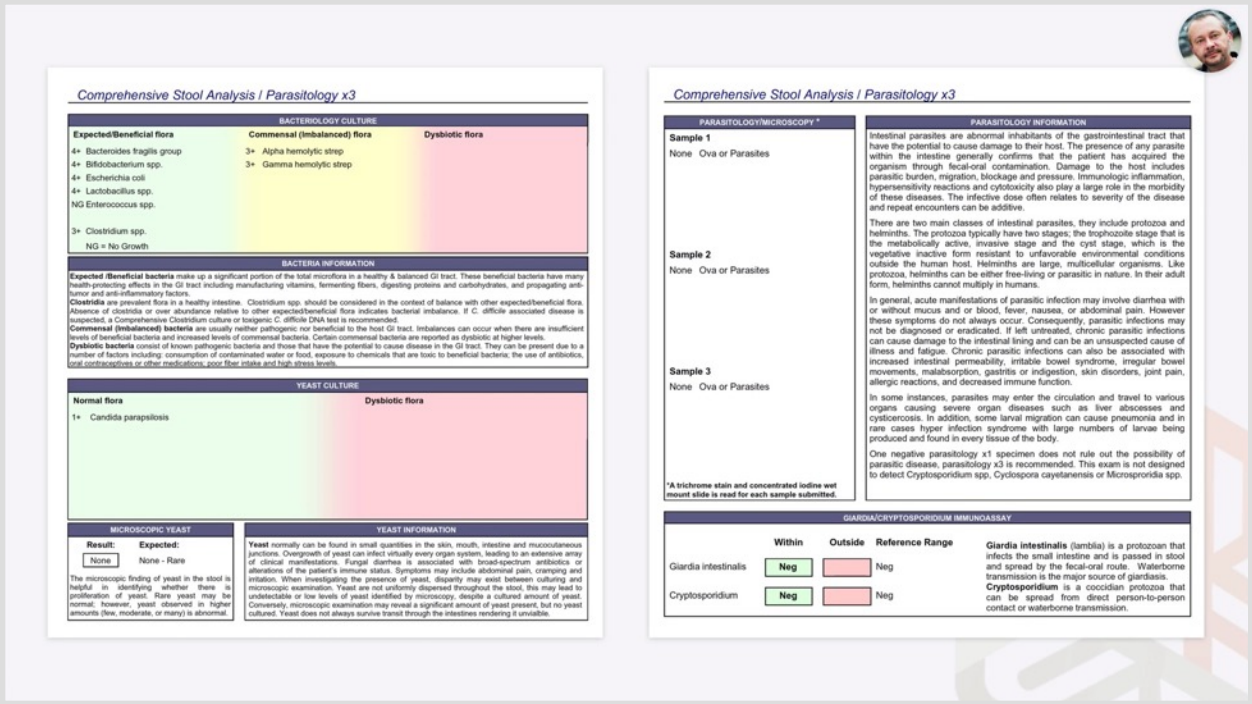
Peak increase values for each trace gas are presented below:

Peak Hydrogen (H2) Production:	**0 ppm**	Normal <20 ppm
Peak Methane (CH4) Production:	**5 ppm**	Normal <3 ppm*
Peak Combined Gas Production:	**5 ppm**	Normal <20 ppm

RESULT: BASED ON THE CRITERIA USED IN THIS STUDY, PRESENCE OF BACTERIAL OVERGROWTH IS SUPPORTED*

NOTES:

Follow-up test with Commonwealth, methane is still very slightly elevated at baseline according to Pimentel criteria, so that is why Commonwealth marked this as a positive, and then the hydrogens were all zeroes. When both hydrogen and methane are at zeroes, I think it's more likely to be a hydrogen sulfide presentation, but when there's some methane, it's a little bit less likely to be the case. And also, I think right after an antimicrobial treatment, when you see lower levels like this, it's less likely to be indicative of hydrogen sulfide.



Comprehensive Stool Analysis / Parasitology x3

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YEAST CULTURE

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1+ Candida parapsilosis	

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Comprehensive Stool Analysis / Parasitology x3

PARASITOLOGY/MICROSCOPY *

Sample 1
None Ova or Parasites

Sample 2
None Ova or Parasites

Sample 3
None Ova or Parasites

*A trichrome stain and concentrated iodine wet mount slide is read for each sample submitted.

PARASITOLOGY INFORMATION

Intestinal parasites are abnormal inhabitants of the gastrointestinal tract that have the potential to cause damage to their host. The presence of any parasite within the intestine generally confirms that the patient has acquired the organism through fecal-oral contamination. Damage to the host includes parasitic burden, migration, blockage and pressure. Immunologic inflammation, hypersensitivity reactions and cytotoxicity also play a large role in the morbidity of these diseases. The infective dose often relates to severity of the disease and repeat encounters can be additive.

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One negative parasitology x1 specimen does not rule out the possibility of parasitic disease, parasitology x3 is recommended. This exam is not designed to detect Cryptosporidium spp, Cyclospora cayetanensis or Microsproridia spp.

GIARDIA/CRYPTOSPORIDIUM IMMUNOASSAY

	Within	Outside	Reference Range
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Cryptosporidium	Neg		Neg

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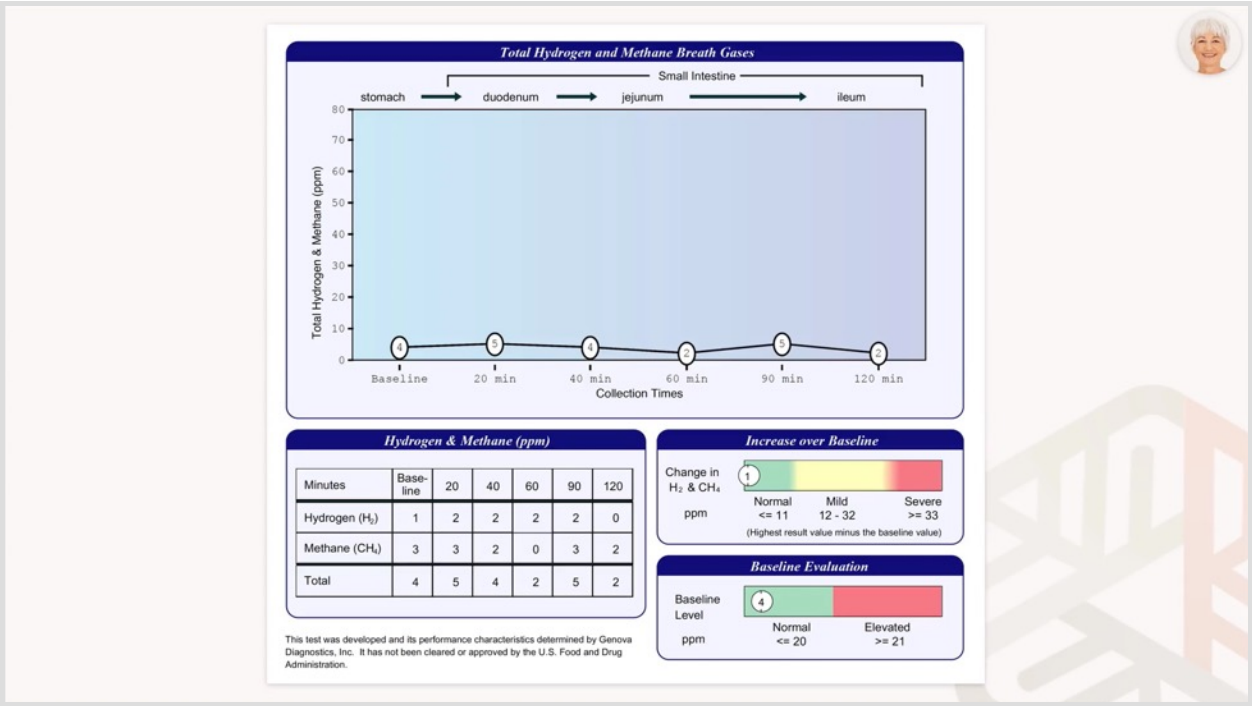
Cryptosporidium is a coccidian protozoa that can be spread from direct person-to-person contact or waterborne transmission.

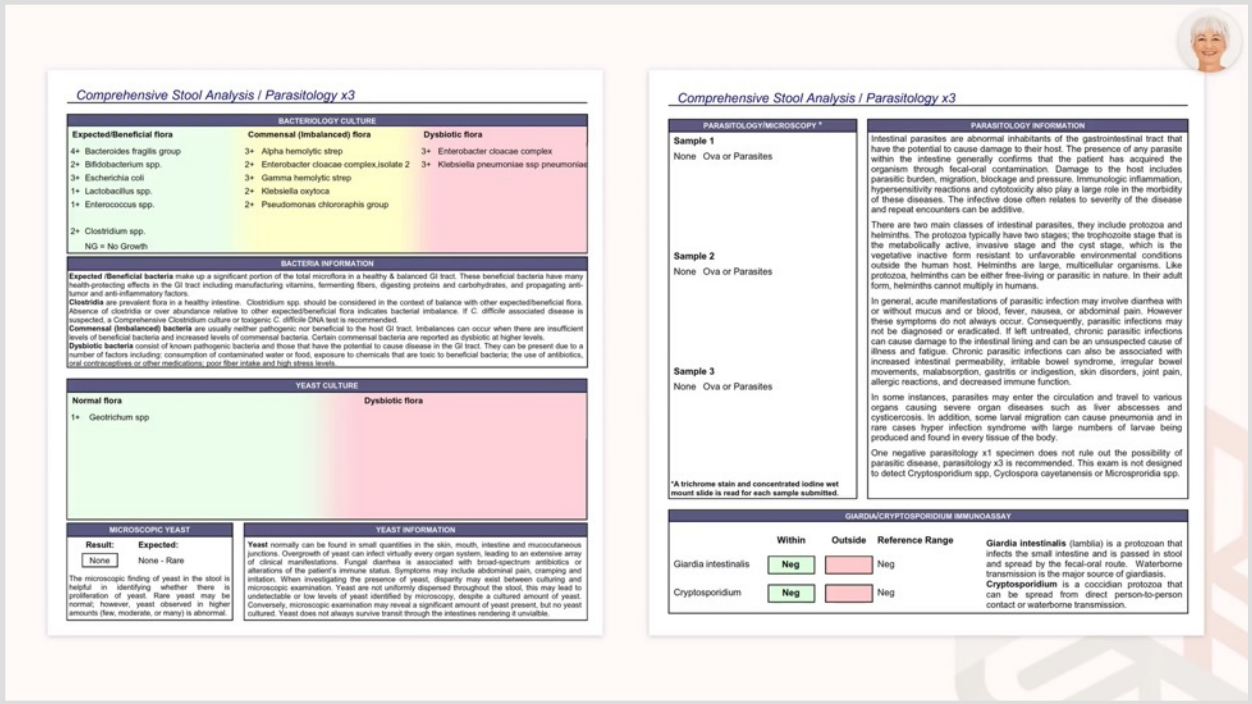
Follow-up Doctor's Data panel showed significant improvement in beneficial bacteria. That's because, as you saw and as you know from the treatment protocols, part of the botanical antimicrobial protocol involves probiotics, so that can help. The fungal overgrowth, the microscopic exam went down from few to none. There is 1+ for candida still showing, but that can be just normal flora, and no parasites showing on the Doctor's Data parasitology section. So in this case, unfortunately the patient's cholesterol didn't come down after addressing the gut and some other issues. His cholesterol was very high, over 300, and when you see it that high, and if it doesn't respond to addressing these underlying problems, it's most likely genetic in origin. Probably, this patient has familial hypercholesterolemia. On the other hand, his mental and physical performance did improve, he lost weight and felt better overall, so the treatment was successful from that perspective.

CASE #4: 64-YEAR-OLD FEMALE

All right, next patient is a 64-year-old female. Her chief complaints were gastrointestinal symptoms, bloating, gas, abdominal pain, cognitive impairment, fatigue, and anxiety. She had a history of a raw food vegan diet, was a yoga teacher actually, felt good when she first started it, but in 2008 had an emergency appendectomy, started to have a lot more abdominal pain, gas, bloating and GI symptoms; did some research and reluctantly switched to a Paleo type of diet, which actually helped tremendously, and then from there to a low-FODMAP version of Paleo diet, and that helped her quite a bit more, but she still had issues, which is why she came to see me.



So we did a SIBO test, and she was absolutely shocked, she was totally convinced she had SIBO, but as you can see here, the levels were all low and negative.



Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
4+ Bacteroides fragilis group	3+ Alpha hemolytic strep	3+ Enterobacter cloacae complex
2+ Bifidobacterium spp.	2+ Enterobacter cloacae complex,isolate 2	3+ Klebsiella pneumoniae ssp pneumoniae
3+ Escherichia coli	3+ Gamma hemolytic strep	
1+ Lactobacillus spp.	2+ Klebsiella oxytoca	
1+ Enterococcus spp.	2+ Pseudomonas chlororaphis group	
2+ Clostridium spp.		
NG = No Growth		

BACTERIA INFORMATION

Expected /Beneficial bacteria make up a significant portion of the total microflora in a healthy & balanced GI tract. These beneficial bacteria have many health-protecting effects in the GI tract including manufacturing vitamins, fermenting fibers, digesting proteins and carbohydrates, and propagating anti-tumor and anti-inflammatory factors.
Clostridia are prevalent flora in a healthy intestine. Clostridium spp. should be considered in the context of balance with other expected/beneficial flora. Absence of clostridia or over abundance relative to other expected/beneficial flora indicates bacterial imbalance. If C. difficile associated disease is suspected, a Comprehensive Clostridium culture or toxigenic C. difficile DNA test is recommended.
Commensal (Imbalanced) bacteria are usually neither pathogenic nor beneficial to the host GI tract. Imbalances can occur when there are insufficient levels of beneficial bacteria and increased levels of commensal bacteria. Certain commensal bacteria are reported as dysbiotic at higher levels.
Dysbiotic bacteria consist of known pathogenic bacteria and those that have the potential to cause disease in the GI tract. They can be present due to a number of factors including: consumption of contaminated water or food; exposure to chemicals that are toxic to beneficial bacteria; the use of antibiotics, oral contraceptives or other medications; poor fiber intake and high stress levels.

YEAST CULTURE

Normal flora	Dysbiotic flora
1+ Geotrichum spp	

MICROSCOPIC YEAST

Result:	Expected:
None	None - Rare

The microscopic finding of yeast in the stool is helpful in identifying whether there is proliferation of yeast. Rare yeast may be normal; however, yeast observed in higher amounts (few, moderate, or many) is abnormal.

YEAST INFORMATION

Yeast normally can be found in small quantities in the skin, mouth, intestine and mucocutaneous junctions. Overgrowth of yeast can infect virtually every organ system, leading to an extensive array of clinical manifestations. Fungal diarrhea is associated with broad-spectrum antibiotics or alterations of the patient's immune status. Symptoms may include abdominal pain, cramping and irritation. When investigating the presence of yeast, disparity may exist between culturing and microscopic examination. Yeast are not uniformly dispersed throughout the stool, this may lead to undetectable or low levels of yeast identified by microscopy, despite a cultured amount of yeast. Conversely, microscopic examination may reveal a significant amount of yeast present, but no yeast cultured. Yeast does not always survive transit through the intestines rendering it unviable.

Comprehensive Stool Analysis / Parasitology x3

PARASITOLOGY/MICROSCOPY *

Sample 1
None Ova or Parasites

Sample 2
None Ova or Parasites

Sample 3
None Ova or Parasites

*A trichrome stain and concentrated iodine wet mount slide is read for each sample submitted.

PARASITOLOGY INFORMATION

Intestinal parasites are abnormal inhabitants of the gastrointestinal tract that have the potential to cause damage to their host. The presence of any parasite within the intestine generally confirms that the patient has acquired the organism through fecal-oral contamination. Damage to the host includes parasitic burden, migration, blockage and pressure. Immunologic inflammation, hypersensitivity reactions and cytotoxicity also play a large role in the morbidity of these diseases. The infective dose often relates to severity of the disease and repeat encounters can be additive.

There are two main classes of intestinal parasites, they include protozoa and helminths. The protozoa typically have two stages; the trophozoite stage that is the metabolically active, invasive stage and the cyst stage, which is the vegetative inactive form resistant to unfavorable environmental conditions outside the human host. Helminths are large, multicellular organisms. Like protozoa, helminths can be either free-living or parasitic in nature. In their adult form, helminths cannot multiply in humans.

In general, acute manifestations of parasitic infection may involve diarrhea with or without mucus and or blood, fever, nausea, or abdominal pain. However these symptoms do not always occur. Consequently, parasitic infections may not be diagnosed or eradicated. If left untreated, chronic parasitic infections can cause damage to the intestinal lining and can be an unsuspected cause of illness and fatigue. Chronic parasitic infections can also be associated with increased intestinal permeability, irritable bowel syndrome, irregular bowel movements, malabsorption, gastritis or indigestion, skin disorders, joint pain, allergic reactions, and decreased immune function.

In some instances, parasites may enter the circulation and travel to various organs causing severe organ diseases such as liver abscesses and cysticercosis. In addition, some larval migration can cause pneumonia and in rare cases hyper infection syndrome with large numbers of larvae being produced and found in every tissue of the body.

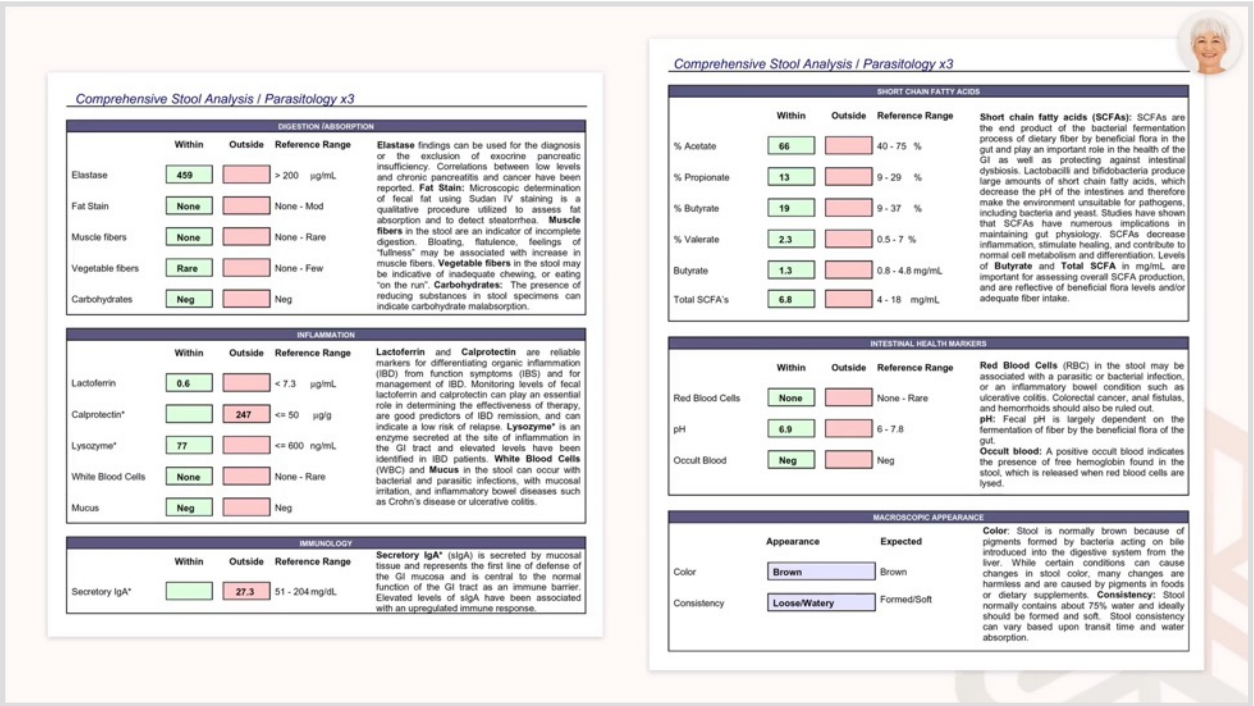
One negative parasitology x1 specimen does not rule out the possibility of parasitic disease, parasitology x3 is recommended. This exam is not designed to detect Cryptosporidium spp, Cyclospora cayetanensis or Microsproridia spp.

GIARDIA/CRYPTOSPORIDIUM IMMUNOASSAY

	Within	Outside	Reference Range
Giardia intestinalis	Neg		Neg
Cryptosporidium	Neg		Neg

Giardia intestinalis (lamblia) is a protozoan that infects the small intestine and is passed in stool and spread by the fecal-oral route. Waterborne transmission is the major source of giardiasis.
Cryptosporidium is a coccidian protozoa that can be spread from direct person-to-person contact or waterborne transmission.

But check out the Doctor's Data stool test results. Significant dysbiosis, both insufficiency dysbiosis and pathogenic dysbiosis. She had 3+ for Enterobacter cloacae and Klebsiella pneumoniae, she had five different species of commensal imbalance at 2+ or 3+, and then she had low levels of Lactobacillus and fairly low levels of Bifidobacteria. She had a Geotrichum species of yeast at 1+, which is, as I've mentioned, probably just a part of the commensal flora, but given her dysbiosis and low levels of beneficial bacteria, that could potentially be a problem.



Comprehensive Stool Analysis / Parasitology x3

DIGESTION /ABSORPTION

	Within	Outside	Reference Range
Elastase	459		> 200 µg/mL
Fat Stain	None		None - Mod
Muscle fibers	None		None - Rare
Vegetable fibers	Rare		None - Few
Carbohydrates	Neg		Neg

Elastase findings can be used for the diagnosis or the exclusion of exocrine pancreatic insufficiency. Correlations between low levels and chronic pancreatitis and cancer have been reported. **Fat Stain:** Microscopic determination of fecal fat using Sudan IV staining is a qualitative procedure utilized to assess fat absorption and to detect steatorrhea. **Muscle fibers** in the stool are an indicator of incomplete digestion. Bloating, flatulence, feelings of "fullness" may be associated with increase in muscle fibers. **Vegetable fibers** in the stool may be indicative of inadequate chewing, or eating "on the run". **Carbohydrates:** The presence of reducing substances in stool specimens can indicate carbohydrate malabsorption.

INFLAMMATION

	Within	Outside	Reference Range
Lactoferrin	0.6		< 7.3 µg/mL
Calprotectin*		247	<= 50 µg/g
Lysozyme*	77		<= 600 ng/mL
White Blood Cells	None		None - Rare
Mucus	Neg		Neg

Lactoferrin and **Calprotectin** are reliable markers for differentiating organic inflammation (IBD) from function symptoms (IBS) and for management of IBD. Monitoring levels of fecal lactoferrin and calprotectin can play an essential role in determining the effectiveness of therapy, are good predictors of IBD remission, and can indicate a low risk of relapse. **Lysozyme*** is an enzyme secreted at the site of inflammation in the GI tract and elevated levels have been identified in IBD patients. **White Blood Cells** (WBC) and **Mucus** in the stool can occur with bacterial and parasitic infections, with mucosal irritation, and inflammatory bowel diseases such as Crohn's disease or ulcerative colitis.

IMMUNOLOGY

	Within	Outside	Reference Range
Secretory IgA*		27.3	51 - 204 mg/dL

Secretory IgA* (sIgA) is secreted by mucosal tissue and represents the first line of defense of the GI mucosa and is central to the normal function of the GI tract as an immune barrier. Elevated levels of sIgA have been associated with an upregulated immune response.

Comprehensive Stool Analysis / Parasitology x3

SHORT CHAIN FATTY ACIDS

	Within	Outside	Reference Range
% Acetate	66		40 - 75 %
% Propionate	13		9 - 29 %
% Butyrate	19		9 - 37 %
% Valerate	2.3		0.5 - 7 %
Butyrate	1.3		0.8 - 4.8 mg/mL
Total SCFA's	6.8		4 - 18 mg/mL

Short chain fatty acids (SCFAs): SCFAs are the end product of the bacterial fermentation process of dietary fiber by beneficial flora in the gut and play an important role in the health of the GI as well as protecting against intestinal dysbiosis. Lactobacilli and bifidobacteria produce large amounts of short chain fatty acids, which decrease the pH of the intestines and therefore make the environment unsuitable for pathogens, including bacteria and yeast. Studies have shown that SCFAs have numerous implications in maintaining gut physiology. SCFAs decrease inflammation, stimulate healing, and contribute to normal cell metabolism and differentiation. Levels of **Butyrate** and **Total SCFA** in mg/mL are important for assessing overall SCFA production, and are reflective of beneficial flora levels and/or adequate fiber intake.

INTESTINAL HEALTH MARKERS

	Within	Outside	Reference Range
Red Blood Cells	None		None - Rare
pH	6.9		6 - 7.8
Occult Blood	Neg		Neg

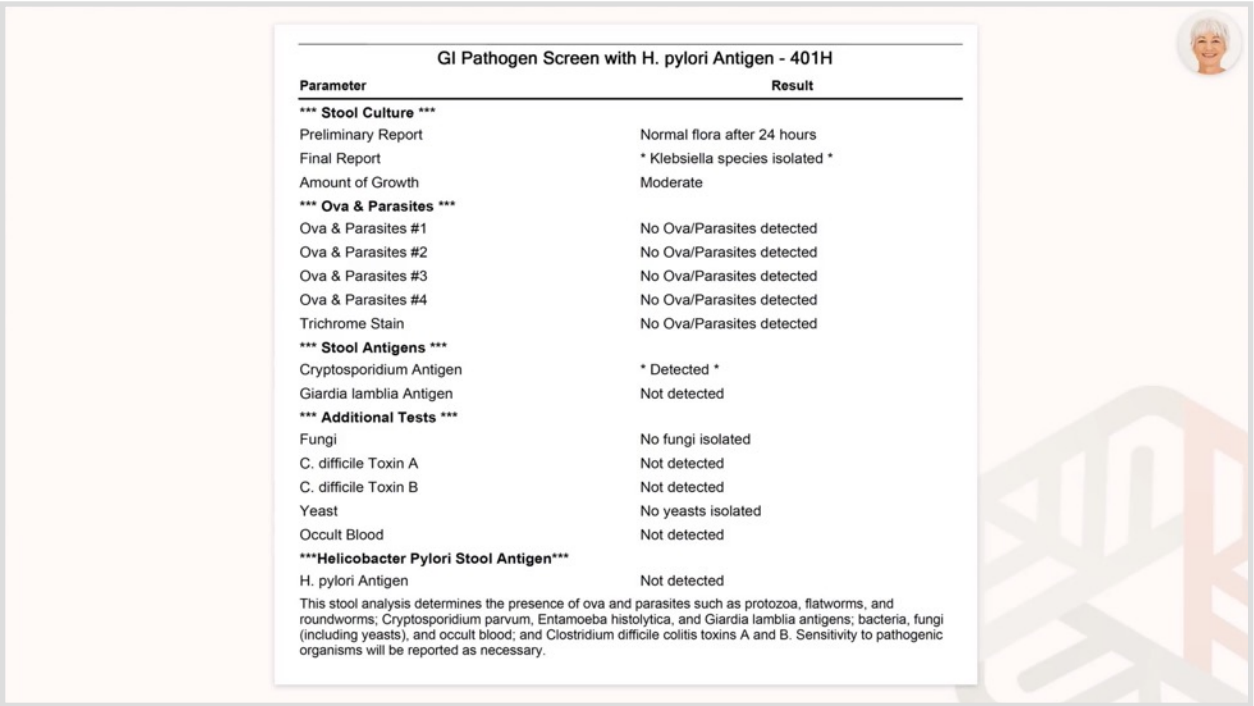
Red Blood Cells (RBC) in the stool may be associated with a parasitic or bacterial infection, or an inflammatory bowel condition such as ulcerative colitis. Colorectal cancer, anal fistulas, and hemorrhoids should also be ruled out.
pH: Fecal pH is largely dependent on the fermentation of fiber by the beneficial flora of the gut.
Occult blood: A positive occult blood indicates the presence of free hemoglobin found in the stool, which is released when red blood cells are lysed.

MACROSCOPIC APPEARANCE

	Appearance	Expected
Color	Brown	Brown
Consistency	Loose/Watery	Formed/Soft

Color: Stool is normally brown because of pigments formed by bacteria acting on bile introduced into the digestive system from the liver. While certain conditions can cause changes in stool color, many changes are harmless and are caused by pigments in foods or dietary supplements. **Consistency:** Stool normally contains about 75% water and ideally should be formed and soft. Stool consistency can vary based upon transit time and water absorption.

Here are the next pages on the Doctor's Data stool report. Her secretory IgA was low, which is not surprising given her dysbiosis, but check out her calprotectin: it's at 247. The upper end of the range is 50, and as you recall from the previous slide, 247 is in the range for active IBD. However, as I said before, you can't make a diagnosis of active IBD just on that basis. The other IBD markers, lactoferrin and lysozyme, were normal, and she does have significant gut issues, so I decided to treat the pathogenic overgrowth and dysbiosis first and then retest her stool test to see where the calprotectin is, and if it was still high, I would either do the IBD blood panel or send her for colonoscopy.

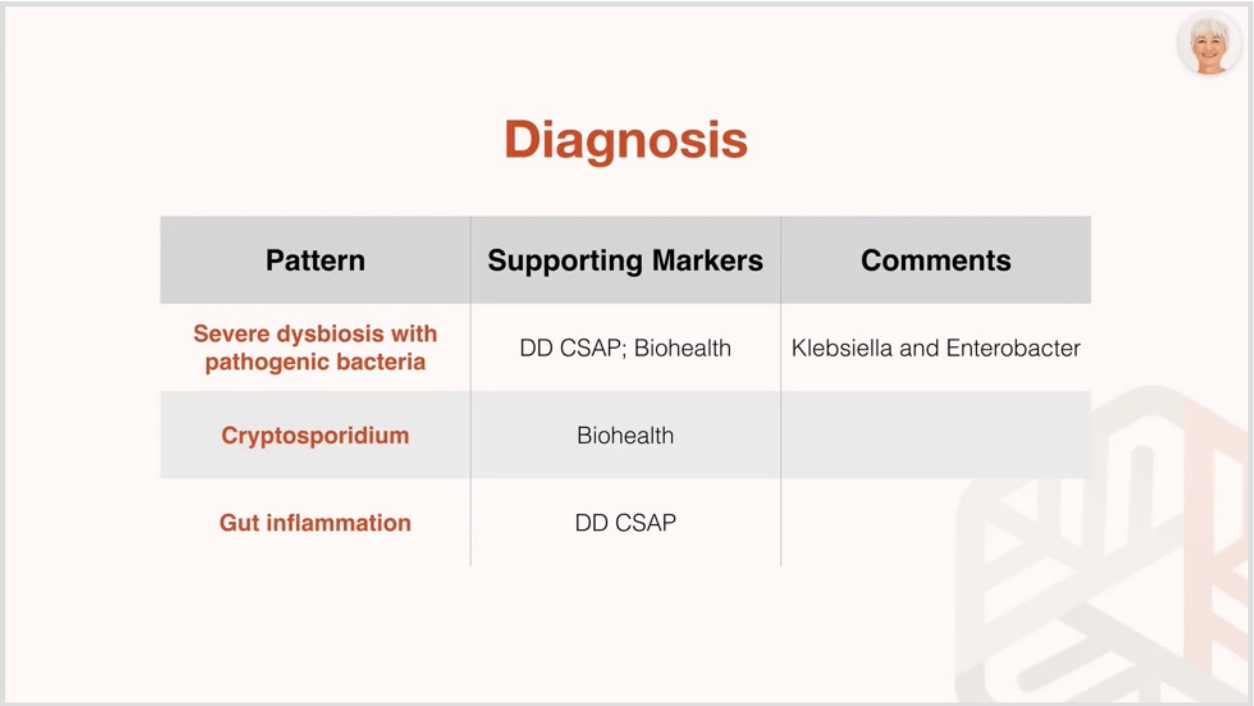


GI Pathogen Screen with H. pylori Antigen - 401H

Parameter	Result
***** Stool Culture *****	
Preliminary Report	Normal flora after 24 hours
Final Report	* Klebsiella species isolated *
Amount of Growth	Moderate
***** Ova & Parasites *****	
Ova & Parasites #1	No Ova/Parasites detected
Ova & Parasites #2	No Ova/Parasites detected
Ova & Parasites #3	No Ova/Parasites detected
Ova & Parasites #4	No Ova/Parasites detected
Trichrome Stain	No Ova/Parasites detected
***** Stool Antigens *****	
Cryptosporidium Antigen	* Detected *
Giardia lamblia Antigen	Not detected
***** Additional Tests *****	
Fungi	No fungi isolated
C. difficile Toxin A	Not detected
C. difficile Toxin B	Not detected
Yeast	No yeasts isolated
Occult Blood	Not detected
*****Helicobacter Pylori Stool Antigen*****	
H. pylori Antigen	Not detected

This stool analysis determines the presence of ova and parasites such as protozoa, flatworms, and roundworms; Cryptosporidium parvum, Entamoeba histolytica, and Giardia lamblia antigens; bacteria, fungi (including yeasts), and occult blood; and Clostridium difficile colitis toxins A and B. Sensitivity to pathogenic organisms will be reported as necessary.

On the BioHealth stool test, Klebsiella again showed up there, and it showed up as moderate growth, so this is a good example of why I do both tests because you can't really see here what's happening specifically with the Klebsiella, but the Doctor's Data panel gives you a bit more information and lets you know that it's pathogenic. However, on the BioHealth test, if you see moderate growth of Klebsiella, Klebsiella when it's moderate or above is pathogenic, so you can still get a sense that something's not right by even just this quantitative summary. Notice that this test also caught Cryptosporidium. Cryptosporidium antigen was positive, and a false positive for a fecal antigen test is quite rare, and this is again why I tend to run both of these tests side by side, so we see that she did have a parasite, and that also could be related to the elevation in calprotectin we saw on the Doctor's Data panel.

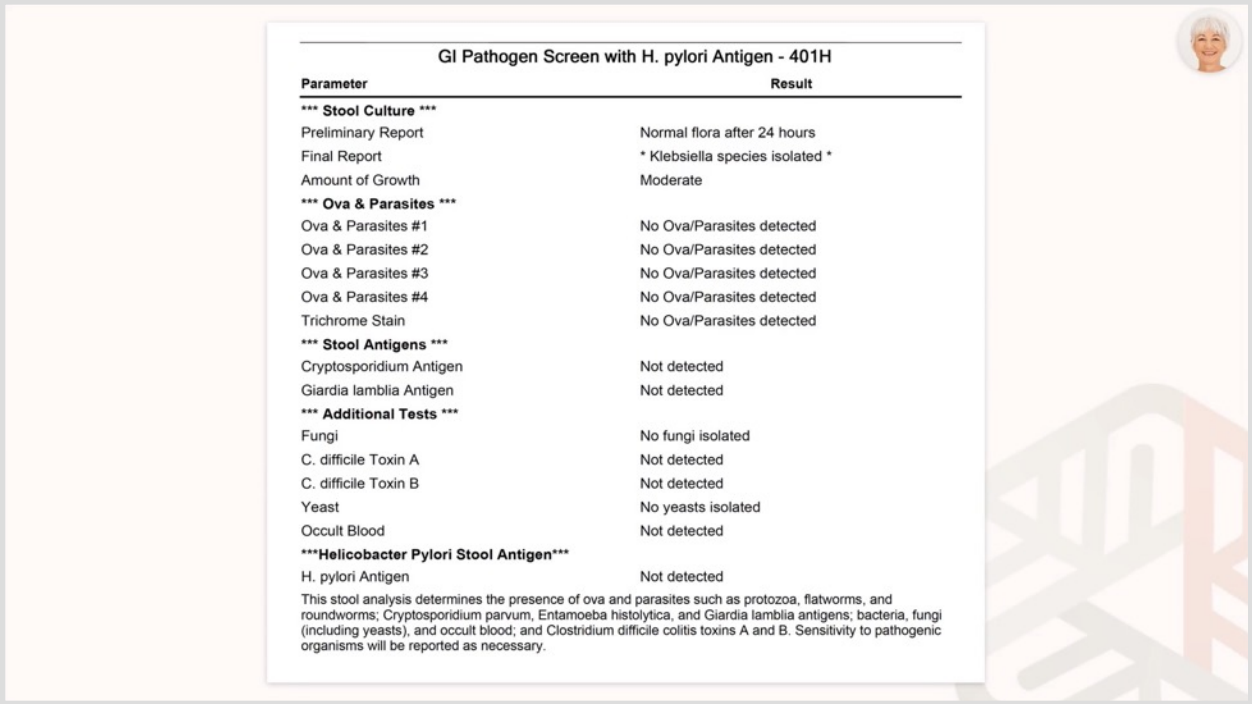


So here's the diagnosis: severe dysbiosis with pathogenic bacteria on the Doctor's Data and BioHealth tests, Cryptosporidium from the BioHealth, and gut inflammation from Doctor's Data. We didn't have a urine organic acids panel for this patient.

Treatment protocol

Nutraceutical	Dosage
GI Synergy	1 packet BID (with breakfast and dinner)
Lauricidin	1 scoop TID with each meal
Interfase Plus	3-4 capsules BID on empty stomach
Prescript Assist	One BID upon rising and before bed
MegaSporeBiotic	One capsule with lunch
Saccharomyces boulardii	3 billion CFU BID at lunch and before bed

The treatment was the core botanical protocol, and then I added Saccharomyces boulardii, which has been shown to be an effective antiparasitic against giardia, Crypto, and other parasites. With Cryptosporidium, it can be challenging to treat, so I would say 60 days with this protocol as kind of a minimum, and it's not unusual to have to go on to either stronger botanicals or pharmaceutical protocols with Crypto.



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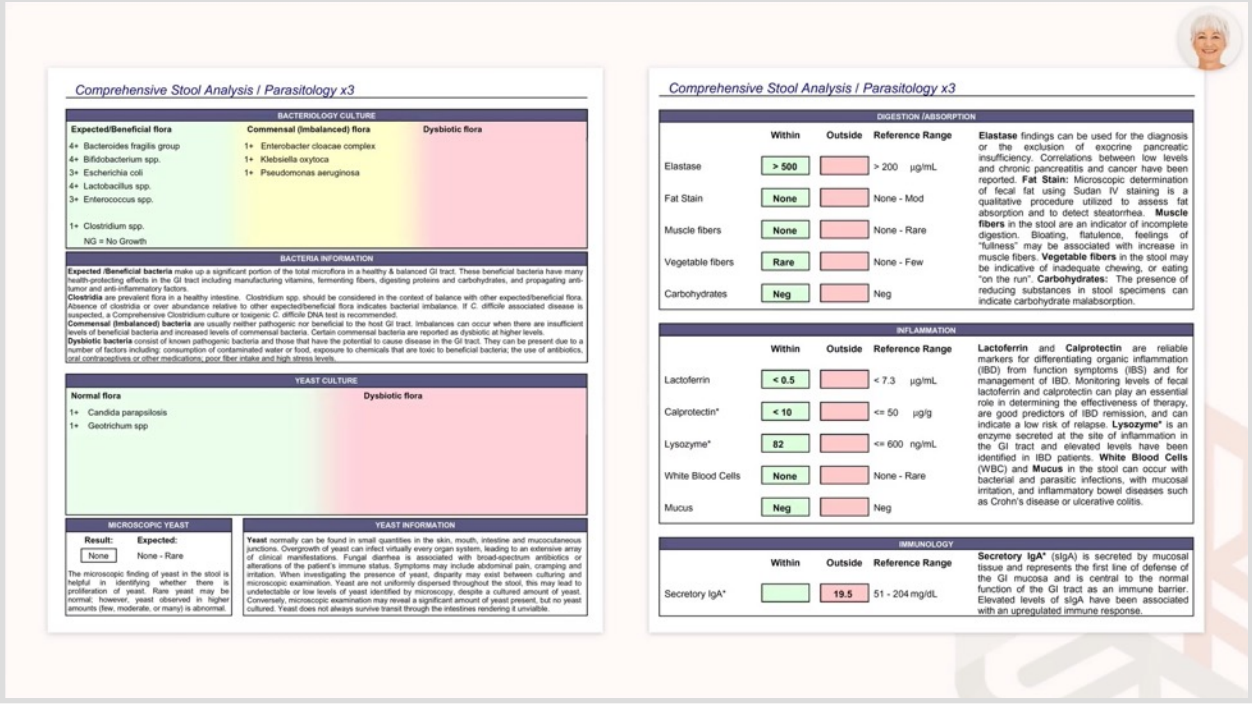
Ova & Parasites #3	No Ova/Parasites detected
Ova & Parasites #4	No Ova/Parasites detected
Trichrome Stain	No Ova/Parasites detected
***** Stool Antigens *****	
Cryptosporidium Antigen	Not detected
Giardia lamblia Antigen	Not detected
***** Additional Tests *****	
Fungi	No fungi isolated
C. difficile Toxin A	Not detected
C. difficile Toxin B	Not detected
Yeast	No yeasts isolated
Occult Blood	Not detected
*****Helicobacter Pylori Stool Antigen*****	
H. pylori Antigen	Not detected

This stool analysis determines the presence of ova and parasites such as protozoa, flatworms, and roundworms; Cryptosporidium parvum, Entamoeba histolytica, and Giardia lamblia antigens; bacteria, fungi (including yeasts), and occult blood; and Clostridium difficile colitis toxins A and B. Sensitivity to pathogenic organisms will be reported as necessary.

Follow-up testing, we see that the Crypto's gone but the Klebsiella is still moderate, still present.



Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
4+ Bacteroides fragilis group	1+ Enterobacter cloacae complex	
4+ Bifidobacterium spp.	1+ Klebsiella oxytoca	
3+ Escherichia coli	1+ Pseudomonas aeruginosa	
4+ Lactobacillus spp.		
3+ Enterococcus spp.		
1+ Clostridium spp.		
NG = No Growth		

BACTERIA INFORMATION

Expected /Beneficial bacteria make up a significant portion of the total microflora in a healthy & balanced GI tract. These beneficial bacteria have many health-protecting effects in the GI tract including manufacturing vitamins, fermenting fibers, digesting proteins and carbohydrates, and propagating anti-tumor and anti-inflammatory factors.
Clostridia are prevalent flora in a healthy intestine. *Clostridium* spp. should be considered in the context of balance with other expected/beneficial flora. Absence of clostridia or over abundance relative to other expected/beneficial flora indicates bacterial imbalance. If *C. difficile* associated disease is suspected, a Comprehensive Clostridium culture or toxigenic *C. difficile* DNA test is recommended.
Commensal (imbalanced) bacteria are usually neither pathogenic nor beneficial to the host GI tract. Imbalances can occur when there are insufficient levels of beneficial bacteria and increased levels of commensal bacteria. Certain commensal bacteria are reported as dysbiotic at higher levels.
Dysbiotic bacteria consist of known pathogenic bacteria and those that have the potential to cause disease in the GI tract. They can be present due to a number of factors including: consumption of contaminated water or food, exposure to chemicals that are toxic to beneficial bacteria; the use of antibiotics, oral contraceptives or other medications, poor fiber intake and high stress levels.

YEAST CULTURE

Normal flora	Dysbiotic flora
1+ Candida parapsilosis	
1+ Geotrichum spp	

MICROSCOPIC YEAST

Result:	Expected:
None	None - Rare

The microscopic finding of yeast in the stool is helpful in identifying whether there is proliferation of yeast. Rare yeast may be normal; however, yeast observed in higher amounts (few, moderate, or many) is abnormal.

YEAST INFORMATION

Yeast normally can be found in small quantities in the skin, mouth, intestine and mucocutaneous junctions. Overgrowth of yeast can infect virtually every organ system, leading to an extensive array of clinical manifestations. Fungal diarrhea is associated with broad-spectrum antibiotics or alterations of the patient's immune status. Symptoms may include abdominal pain, cramping and irritation. When investigating the presence of yeast, disparity may exist between culturing and microscopic examination. Yeast are not uniformly dispersed throughout the stool, this may lead to undetectable or low levels of yeast identified by microscopy, despite a cultured amount of yeast. Conversely, microscopic examination may reveal a significant amount of yeast present, but no yeast cultured. Yeast does not always survive transit through the intestines rendering it unviable.

Comprehensive Stool Analysis / Parasitology x3

DIGESTION /ABSORPTION

	Within	Outside	Reference Range	
Elastase	> 500		> 200	µg/mL
Fat Stain	None		None - Mod	
Muscle fibers	None		None - Rare	
Vegetable fibers	Rare		None - Few	
Carbohydrates	Neg		Neg	

Elastase findings can be used for the diagnosis or the exclusion of exocrine pancreatic insufficiency. Correlations between low levels and chronic pancreatitis and cancer have been reported. **Fat Stain:** Microscopic determination of fecal fat using Sudan IV staining is a qualitative procedure utilized to assess fat absorption and to detect steatorrhea. **Muscle fibers** in the stool are an indicator of incomplete digestion. Bloating, flatulence, feelings of "fullness" may be associated with increase in muscle fibers. **Vegetable fibers** in the stool may be indicative of inadequate chewing, or eating "on the run". **Carbohydrates:** The presence of reducing substances in stool specimens can indicate carbohydrate malabsorption.

INFLAMMATION

	Within	Outside	Reference Range	
Lactoferrin	< 0.5		< 7.3	µg/mL
Calprotectin*	< 10		<= 50	µg/g
Lysozyme*	82		<= 600	ng/mL
White Blood Cells	None		None - Rare	
Mucus	Neg		Neg	

Lactoferrin and **Calprotectin** are reliable markers for differentiating organic inflammation (IBD) from function symptoms (IBS) and for management of IBD. Monitoring levels of fecal lactoferrin and calprotectin can play an essential role in determining the effectiveness of therapy, are good predictors of IBD remission, and can indicate a low risk of relapse. **Lysozyme*** is an enzyme secreted at the site of inflammation in the GI tract and elevated levels have been identified in IBD patients. **White Blood Cells** (WBC) and **Mucus** in the stool can occur with bacterial and parasitic infections, with mucosal irritation, and inflammatory bowel diseases such as Crohn's disease or ulcerative colitis.

IMMUNOLOGY

	Within	Outside	Reference Range	
Secretory IgA*		19.5	51 - 204	mg/dL

Secretory IgA* (sIgA) is secreted by mucosal tissue and represents the first line of defense of the GI mucosa and is central to the normal function of the GI tract as an immune barrier. Elevated levels of sIgA have been associated with an upregulated immune response.

On the Doctor's Data stool panel, the Klebsiella is gone, which is a little strange; you'll sometimes see those discrepancies. Notice that calprotectin is normal again, which suggests that the elevation of calprotectin was due to the gut pathogens rather than IBD, and sIgA is a little low, so again, that can often be the last marker to improve.