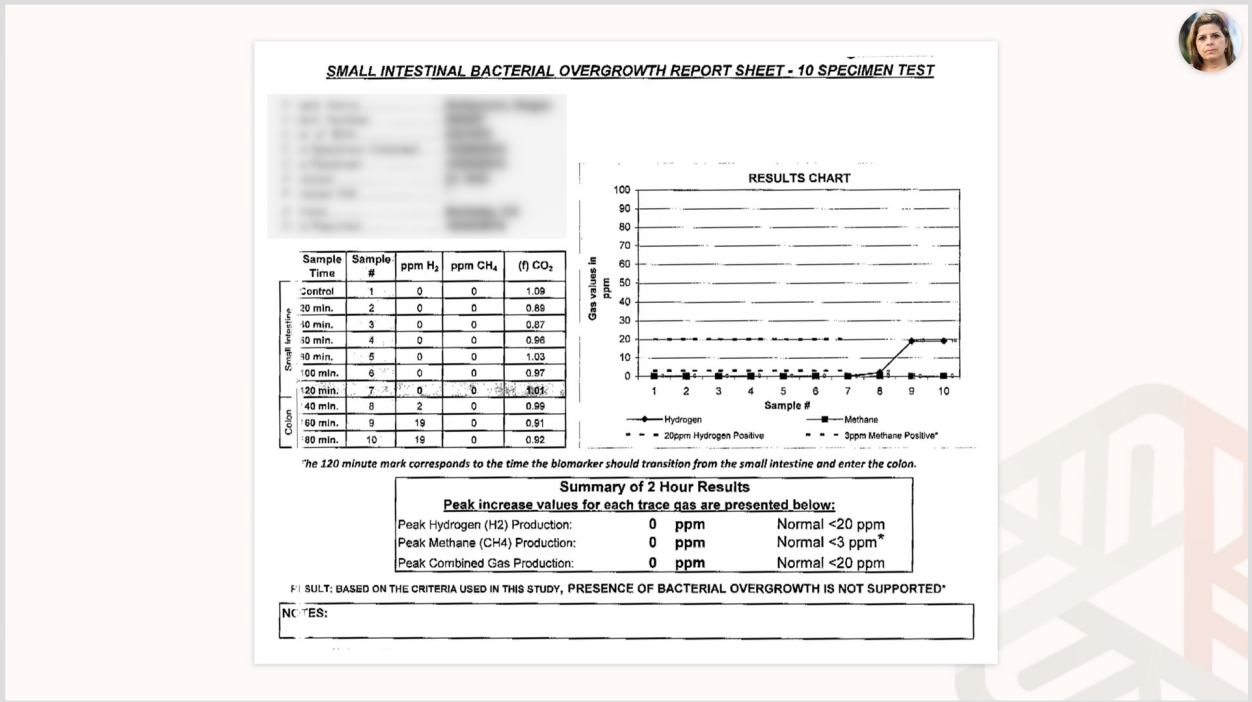
KRESSER INSTITUTE FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

Gut Case Studies - Part 5

CASE #9: 39-YEAR-OLD FEMALE

Next patient: 39-year-old female, her chief complaints were high cholesterol, intermittent GI issues like constipation, undigested food in the stool, irregular ovulation and low libido, insomnia, exercise intolerance. She had been gluten-free for the past two-and-a-half years, everything had gotten better on a Paleo diet for a little while, but then it increased again, got worse. She was a paramedic so she worked 24-hour shifts, which is just crazy, I don't know how they do that. She did back-to-back 24-hour shifts, again I can't understand how they even allow that, and after she did that, she felt like her life fell apart. It was like a severe depletion of metabolic reserve, I think; we'll talk about that in the HPA axis unit, significant stressor, and she just kind of fell apart, and didn't recover from that, and you'll see that happen in patients. She developed insomnia and mood swings and actually complete amenorrhea after that back-to-back shift.



SMALL INTESTINAL BACTERIAL OVERGROWTH REPORT SHEET - 10 SPECIMEN TEST

[redacted]

	Sample Time	Sample #	ppm H_2	ppm CH_4	(f) CO_2
Small Intestine	Control	1	0	0	1.09
	20 min.	2	0	0	0.89
	40 min.	3	0	0	0.87
	60 min.	4	0	0	0.96
	80 min.	5	0	0	1.03
	100 min.	6	0	0	0.97
	120 min.	7	0	0	1.01
Colon	140 min.	8	2	0	0.99
	160 min.	9	19	0	0.91
	180 min.	10	19	0	0.92

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

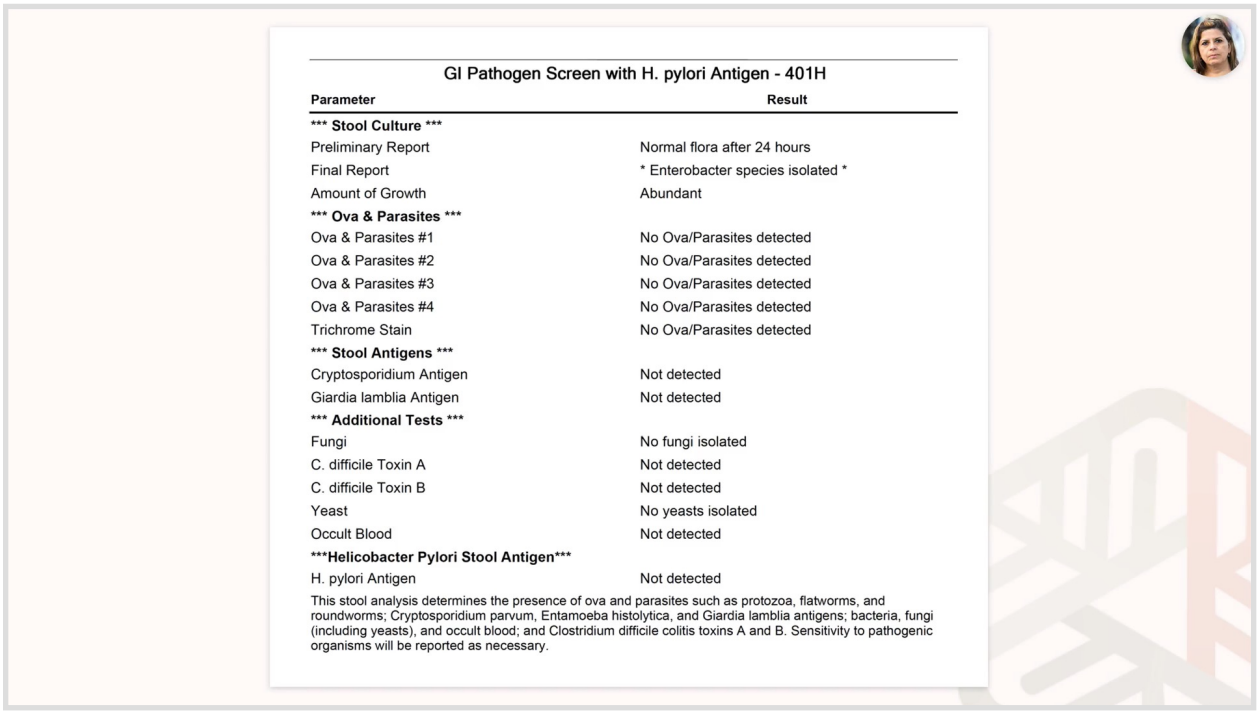
Peak increase values for each trace gas are presented below:

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

RESULT: BASED ON THE CRITERIA USED IN THIS STUDY, PRESENCE OF BACTERIAL OVERGROWTH IS NOT SUPPORTED*

NOTES:

Her SIBO test, not really anything to see here at all. She had mostly zeroes, but there is an increase in hydrogen in the colon, so that to me would make hydrogen sulfide production less likely.

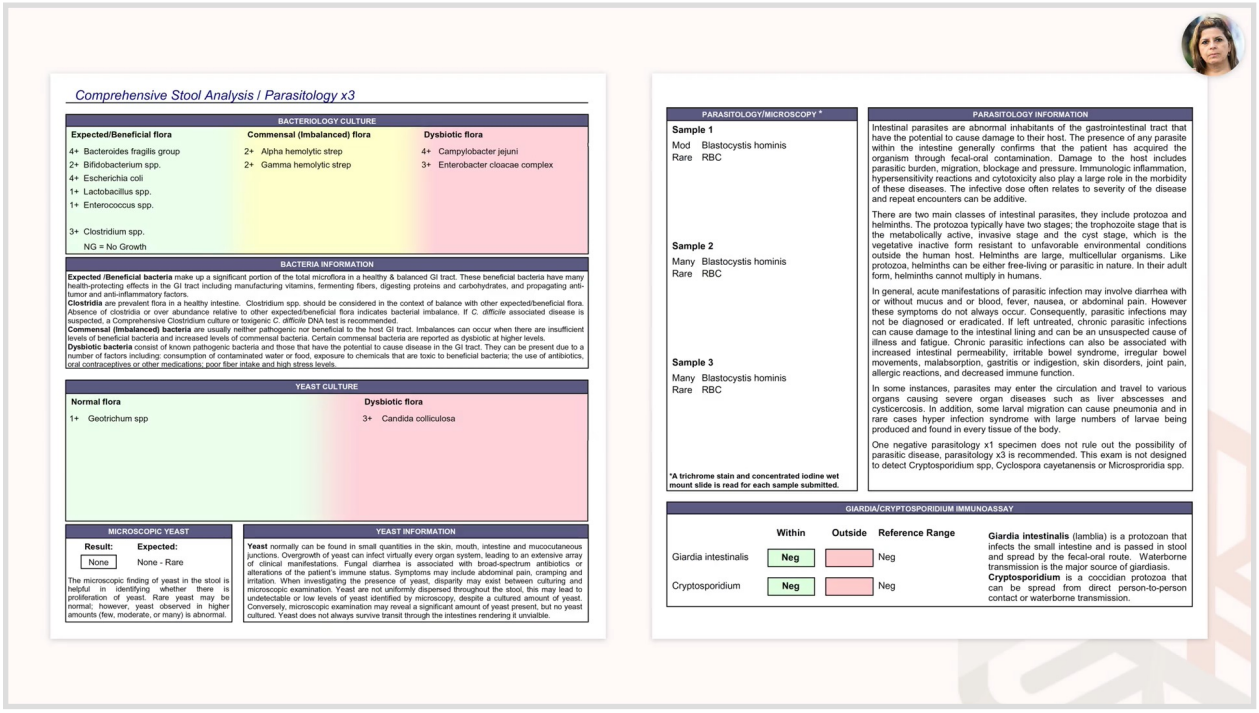


GI Pathogen Screen with H. pylori Antigen - 401H

Parameter	Result
***** Stool Culture *****	
Preliminary Report	Normal flora after 24 hours
Final Report	* Enterobacter species isolated *
Amount of Growth	Abundant
***** 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	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.

Here's her BioHealth stool test, nothing to see here either.



Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
4+ Bacteroides fragilis group	2+ Alpha hemolytic strep	4+ Campylobacter jejuni
2+ Bifidobacterium spp.	2+ Gamma hemolytic strep	3+ Enterobacter cloacae complex
4+ Escherichia coli		
1+ Lactobacillus spp.		
1+ Enterococcus spp.		
3+ 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	3+ Candida colliculosa

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.

PARASITOLOGY/MICROSCOPY *

Sample 1
Mod Blastocystis hominis
Rare RBC

Sample 2
Many Blastocystis hominis
Rare RBC

Sample 3
Many Blastocystis hominis
Rare RBC

***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.

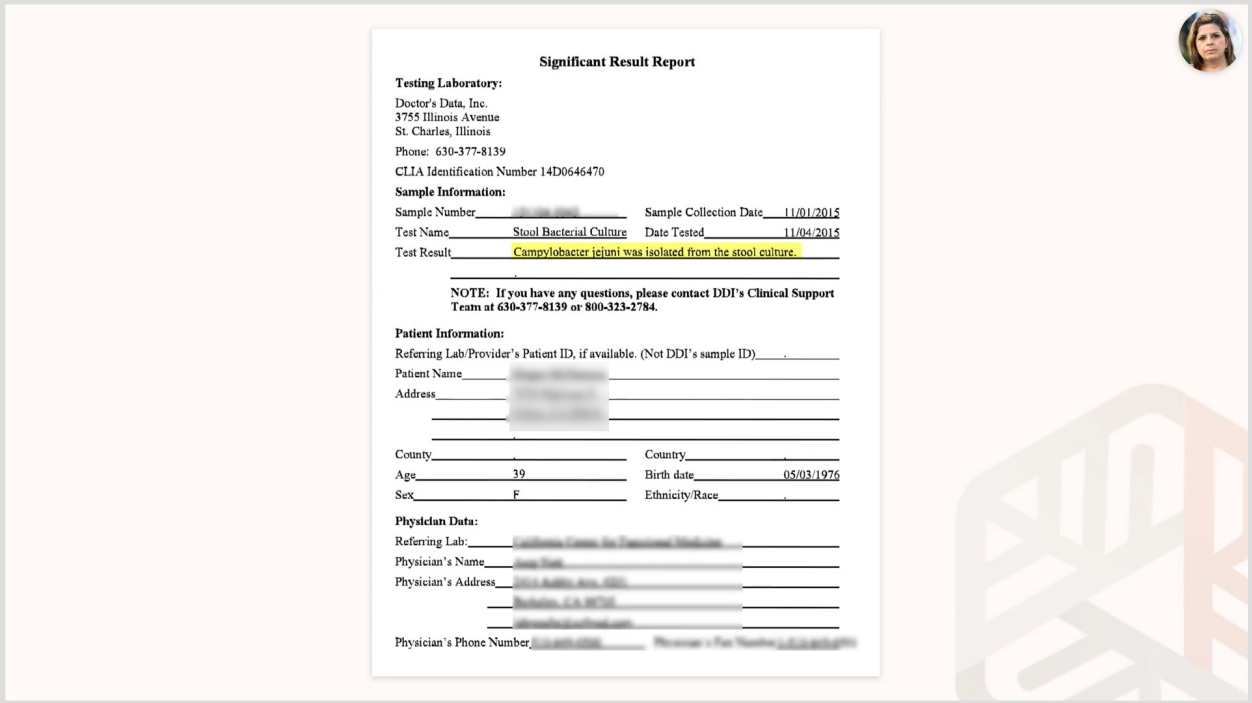
GIARDIA/CRYPTOSPORIDIUM IMMUNOASSAY

	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.

Doctor's Data, though, she had a 4+ for Campylobacter jejeuni, and a 3+ for Enterobacter cloacae, and then she had a 3+ for candida, the candida species was just dysbiotic, so she had some fungal overgrowth, she had some pathogenic bacteria, and she had 1+ only for

Lactobacillus and a 2+ for Bifidobacterium, so insufficiency dysbiosis, and then she had moderate or many Blastocystis hominis in all three stool samples.



Significant Result Report

Testing Laboratory:

Doctor's Data, Inc.
3755 Illinois Avenue
St. Charles, Illinois

Phone: 630-377-8139

CLIA Identification Number 14D0646470

Sample Information:

Sample Number [redacted] Sample Collection Date 11/01/2015

Test Name Stool Bacterial Culture Date Tested 11/04/2015

Test Result Campylobacter jejuni was isolated from the stool culture.

NOTE: If you have any questions, please contact DDI's Clinical Support Team at 630-377-8139 or 800-323-2784.

Patient Information:

Referring Lab/Provider's Patient ID, if available. (Not DDI's sample ID)

Patient Name [redacted]

Address [redacted]

County Country

Age 39 Birth date 05/03/1976

Sex F Ethnicity/Race

Physician Data:

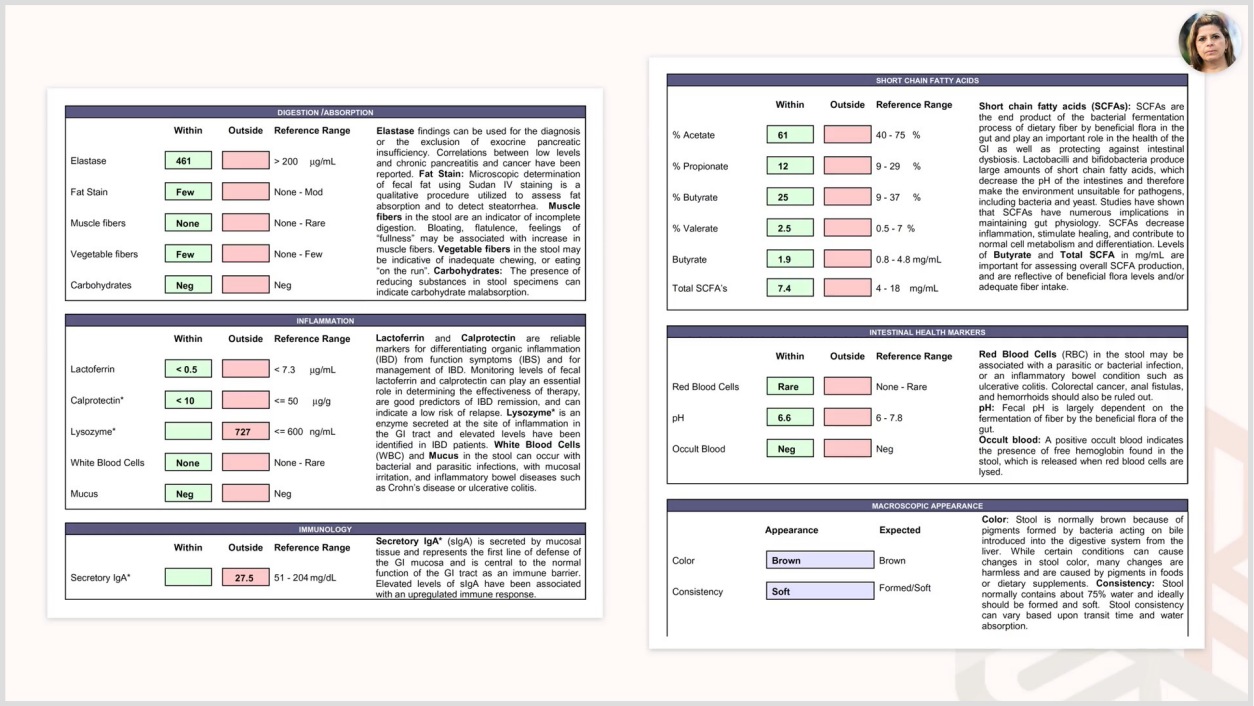
Referring Lab: [redacted]

Physician's Name [redacted]

Physician's Address [redacted]

Physician's Phone Number [redacted]

Doctor's Data will send a significant result report when they identify a pathogen that's classed as reportable by the CDC, and Campylobacter is definitely one of those. These reportable pathogens typically include microbes that cause foodborne illness like Campylobacter. They're supposed to be acute and self-limiting if you look up the research on them, but I've seen some of these pathogens in patients who have not recently had any episode of foodborne illness that they're aware of, and I suspect that some of these pathogens may have a chronic form.



DIGESTION /ABSORPTION

	Within	Outside	Reference Range
Elastase	461		> 200 µg/mL
Fat Stain	Few		None - Mod
Muscle fibers	None		None - Rare
Vegetable fibers	Few		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*		727	<= 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*		27.5	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.

SHORT CHAIN FATTY ACIDS

	Within	Outside	Reference Range
% Acetate	61		40 - 75 %
% Propionate	12		9 - 29 %
% Butyrate	25		9 - 37 %
% Valerate	2.5		0.5 - 7 %
Butyrate	1.9		0.8 - 4.8 mg/mL
Total SCFA's	7.4		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	6.6		6 - 7.8
Occult Blood	Neg		Neg

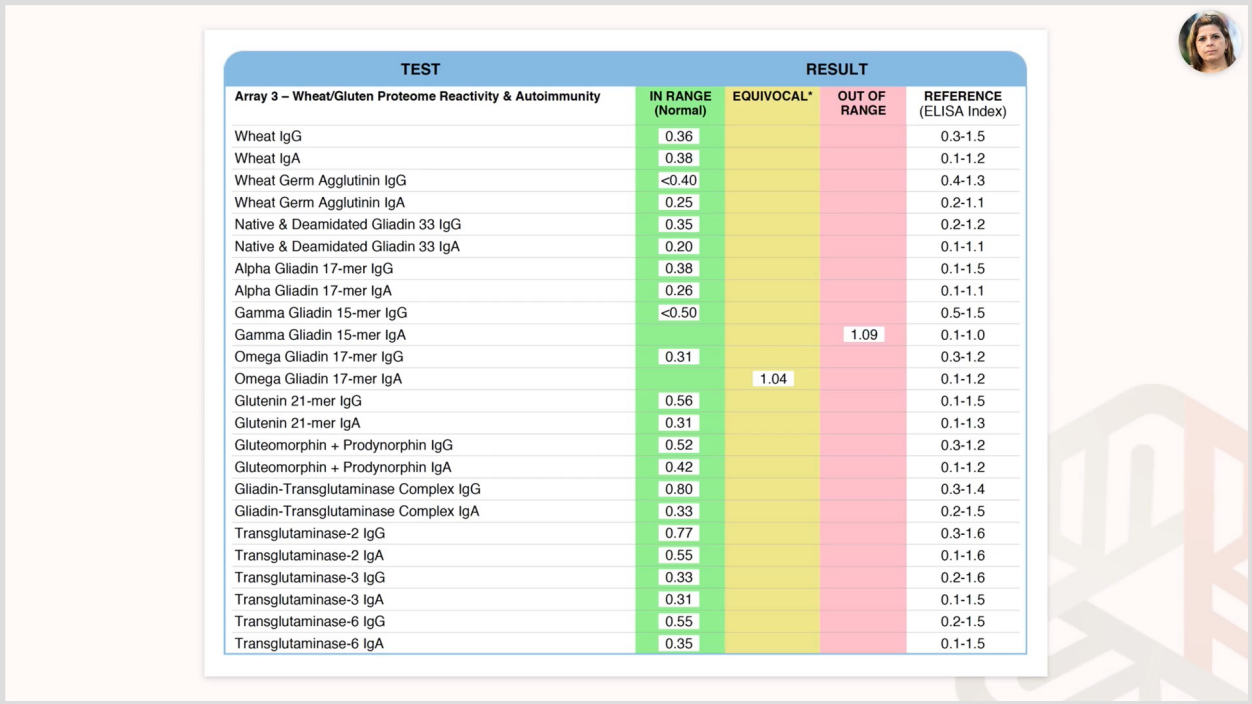
Red Blood Cells (RBC) in the stool may be associated with a parasitic or bacterial infection, or an inflammatory bowel condition such as ulcerative colitis. Colorectal cancer, anal fistulas, and hemorrhoids should also be ruled out.
pH: Fecal pH is largely dependent on the fermentation of fiber by the 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.

Rest of her stool panel, Doctor's Data, only two things that were remarkable, one was elevated lysozyme, but only mildly, and this typically occurs with pathogens as we discussed, and her secretory IgA was a little bit low.



TEST	RESULT			
Array 3 – Wheat/Gluten Proteome Reactivity & Autoimmunity	IN RANGE (Normal)	EQUIVOCAL*	OUT OF RANGE	REFERENCE (ELISA Index)
Wheat IgG	0.36			0.3-1.5
Wheat IgA	0.38			0.1-1.2
Wheat Germ Agglutinin IgG	<0.40			0.4-1.3
Wheat Germ Agglutinin IgA	0.25			0.2-1.1
Native & Deamidated Gliadin 33 IgG	0.35			0.2-1.2
Native & Deamidated Gliadin 33 IgA	0.20			0.1-1.1
Alpha Gliadin 17-mer IgG	0.38			0.1-1.5
Alpha Gliadin 17-mer IgA	0.26			0.1-1.1
Gamma Gliadin 15-mer IgG	<0.50			0.5-1.5
Gamma Gliadin 15-mer IgA			1.09	0.1-1.0
Omega Gliadin 17-mer IgG	0.31			0.3-1.2
Omega Gliadin 17-mer IgA		1.04		0.1-1.2
Glutenin 21-mer IgG	0.56			0.1-1.5
Glutenin 21-mer IgA	0.31			0.1-1.3
Gluteomorphin + Prodynorphin IgG	0.52			0.3-1.2
Gluteomorphin + Prodynorphin IgA	0.42			0.1-1.2
Gliadin-Transglutaminase Complex IgG	0.80			0.3-1.4
Gliadin-Transglutaminase Complex IgA	0.33			0.2-1.5
Transglutaminase-2 IgG	0.77			0.3-1.6
Transglutaminase-2 IgA	0.55			0.1-1.6
Transglutaminase-3 IgG	0.33			0.2-1.6
Transglutaminase-3 IgA	0.31			0.1-1.5
Transglutaminase-6 IgG	0.55			0.2-1.5
Transglutaminase-6 IgA	0.35			0.1-1.5

Cyrex Array 3, she was occasionally eating gluten so she wanted to find out, and she was producing IgA antibodies to gamma-gliadin and IgA equivocal antibodies to omega-gliadin, so I advised her to avoid gluten.

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	0.45			0.4-1.4
Cow's Milk	0.18			0.1-1.3
Casein (Alpha & Beta)	0.21			0.1-1.7
Casomorphin	0.43			0.2-1.6
Milk Butyrophilin	0.61			0.2-1.8
Whey Protein	0.22			0.1-1.3
Chocolate (Milk)	0.22			0.1-1.4
Oats	0.28			0.2-1.0
Yeast	0.47			0.2-1.2
Coffee	0.45			0.3-1.9
Sesame	0.25			0.1-1.3
Buckwheat	<0.40			0.4-1.3
Sorghum	<0.30			0.3-1.2
Millet	<0.30			0.3-1.5
Hemp	0.43			0.3-1.5
Amaranth	0.41			0.2-1.3
Quinoa	<0.50			0.5-1.5
Tapioca	0.29			0.1-1.1
Teff	0.36			0.2-1.1
Soy	<0.50			0.5-1.5
Egg			2.10	0.2-1.7
Corn	0.66			0.3-1.4
Rice	0.46			0.4-1.6
Potato	<0.60			0.6-1.4

And her Cyrex Array 4 was pretty unremarkable except for eggs, and you will see eggs turn up a lot on these panels, and it's unfortunate because a lot of patients eat eggs. This is probably one reason it does turn up, a lot of patients are eating eggs almost every day in some form.

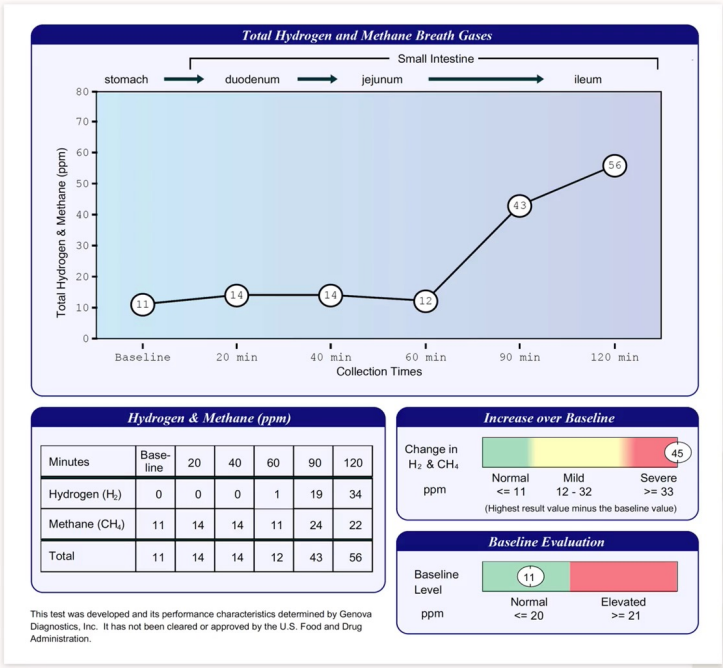
Diagnosis

Pattern	Supporting Markers	Comments
Blastocystis hominis infection	DD CSAP	
Dysbiosis w/ enteropathogens	DD CSAP	Campylobacter jejuni; E. clocae
Fungal overgrowth	DD CSAP	

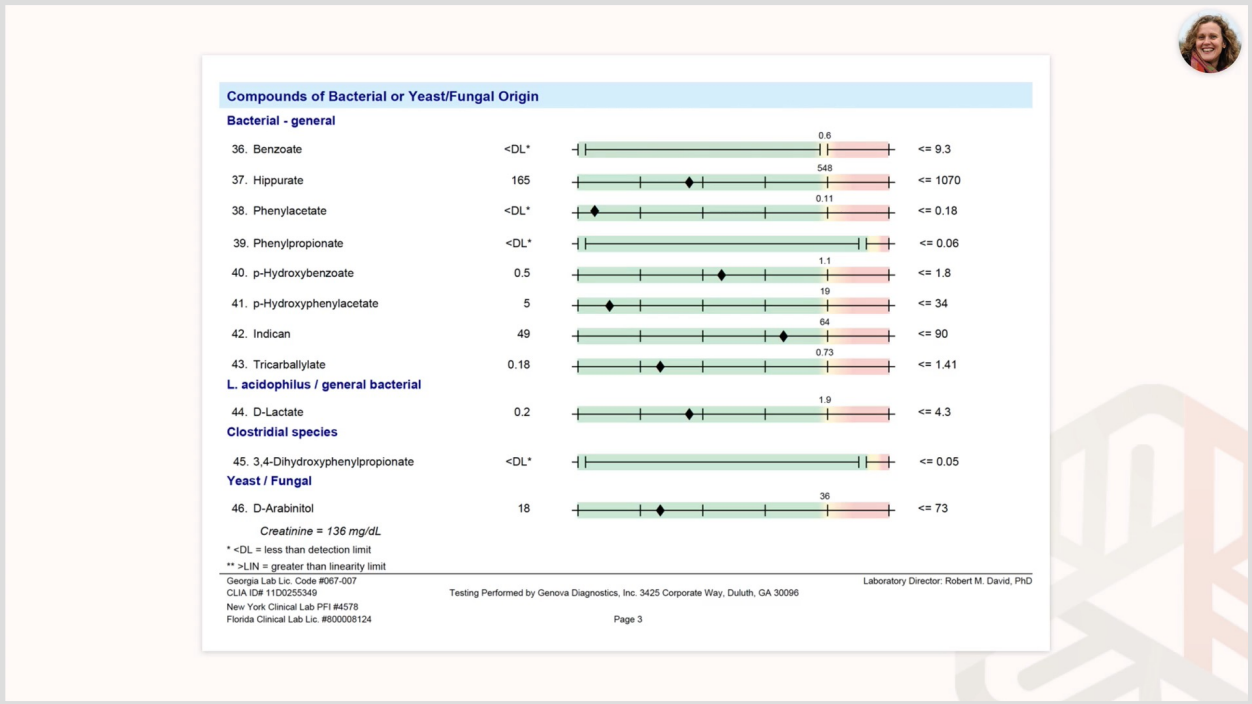
The diagnosis for her was Blastocystis hominis infection, very likely pathogenic given that it was moderate to many on all three stool samples, dysbiosis with enteropathogens, Campylobacter jejeuni, and then fungal overgrowth, the dysbiotic candida species.

CASE #10: 45-YEAR-OLD FEMALE

Okay, next patient is a 45-year-old female, her chief and only complaint really was nasal congestion. She was diagnosed with hypothyroidism several years ago, but it was under control, at least from a lab perspective, with replacement thyroid hormone. Red wine was the only observed trigger she had for the nasal congestion. She did GAPS intro diet and her sinuses cleared up for about three weeks, but as soon as she started adding more food back in her diet, her sinuses plugged up again. She was tested for allergies and food intolerances with another practitioner, all of that was normal. She was completely off gluten, grains, and dairy.



Here are the SIBO results, marked positive for hydrogen here, Genova marked it positive, but it could be transit time, she had normal stools and average transit time can be less than 120 minutes and even less than 90 in some healthy people, so you see zeroes through 40 minutes, goes up to one at 60, then 19 parts per million at 90 minutes, that's all still normal according to Quintron criteria, and then it goes from 19 to 34 at 120 minutes. So it's kind of equivocal, it's a late hydrogen peak there, however, methane is positive by any criteria, it goes from 11 at baseline to 24 at 90 minutes, and of course, that's obviously positive using the Pimentel criteria.



Compounds of Bacterial or Yeast/Fungal Origin

Bacterial - general			
36. Benzoate	<DL*	0.6	<= 9.3
37. Hippurate	165	548	<= 1070
38. Phenylacetate	<DL*	0.11	<= 0.18
39. Phenylpropionate	<DL*		<= 0.06
40. p-Hydroxybenzoate	0.5	1.1	<= 1.8
41. p-Hydroxyphenylacetate	5	19	<= 34
42. Indican	49	64	<= 90
43. Tricarballylate	0.18	0.73	<= 1.41
L. acidophilus / general bacterial			
44. D-Lactate	0.2	1.9	<= 4.3
Clostridial species			
45. 3,4-Dihydroxyphenylpropionate	<DL*		<= 0.05
Yeast / Fungal			
46. D-Arabinitol	18	36	<= 73

Creatinine = 136 mg/dL

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

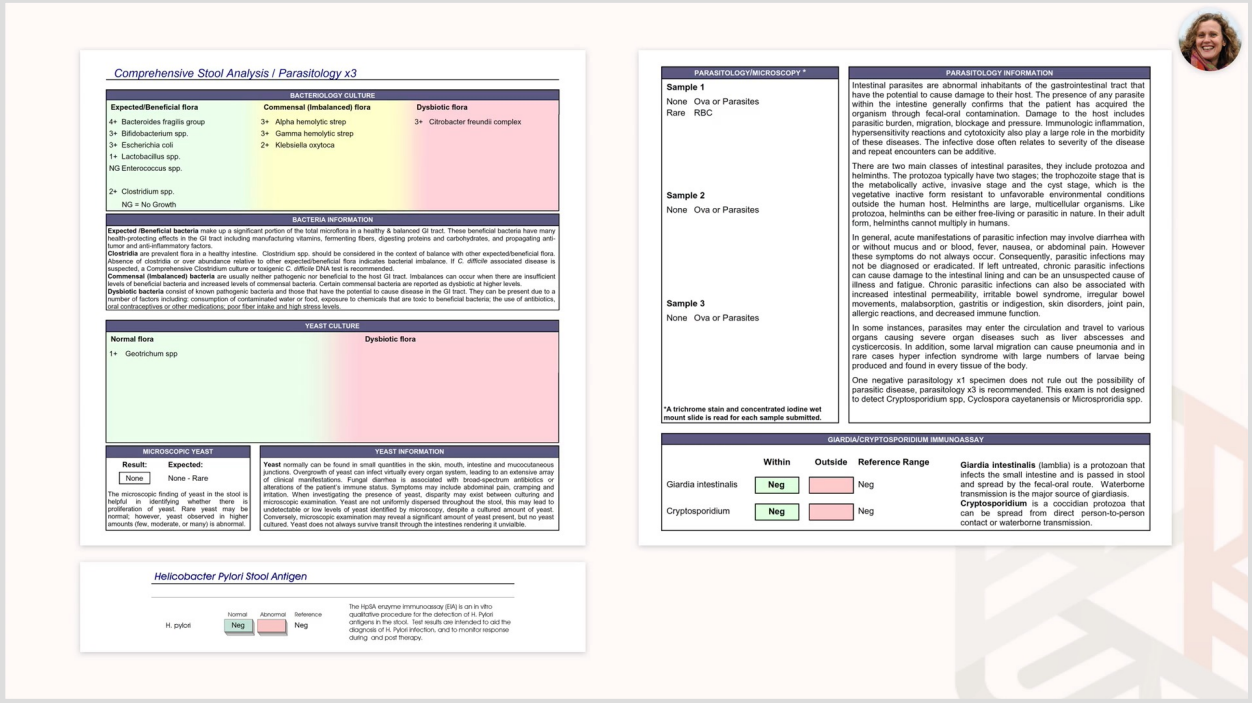
Georgia Lab Lic. Code #067-007
CLIA ID# 11D0255349
New York Clinical Lab PFI #4578
Florida Clinical Lab Lic. #800008124

Testing Performed by Genova Diagnostics, Inc. 3425 Corporate Way, Duluth, GA 30096

Laboratory Director: Robert M. David, PhD

Page 3

Nothing to see on the organic acids test.



Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (imbalanced) flora	Dysbiotic flora
4+ Bacteroides fragilis group	3+ Alpha hemolytic strep	3+ Citrobacter freundii complex
3+ Bifidobacterium spp.	3+ Gamma hemolytic strep	
3+ Escherichia coli	2+ Klebsiella oxytoca	
1+ Lactobacillus spp.		
NG 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+ 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.

PARASITOLOGY/MICROSCOPY *

Sample 1
None Ova or Parasites
Rare RBC

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 Microsporidia spp.

GIARDIA/CRYPTOSPORIDIUM IMMUNOASSAY

	Within	Outside	Reference Range
Giardia intestinalis	Neg		Neg
Cryptosporidium	Neg		Neg

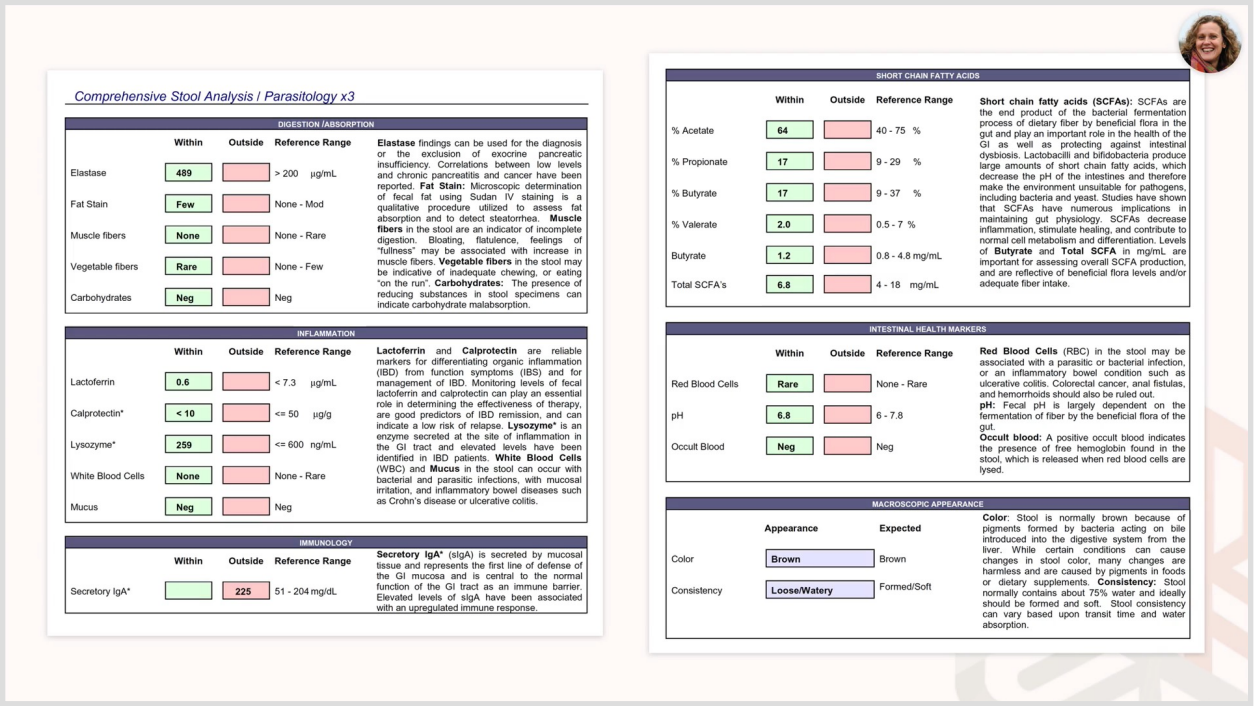
Giardia intestinalis (lamblia) is a protozoan that infects the small intestine and is passed in stool and spread by the fecal-oral route. Waterborne transmission is the major source of giardiasis.
Cryptosporidium is a coccidian protozoa that can be spread from direct person-to-person contact or waterborne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

Helicobacter Pylori Stool Antigen

	Normal	Abnormal	Reference
H. pylori	Neg		Neg

The HpSA enzyme immunoassay (EIA) is an in vitro qualitative procedure for the detection of H. Pylori antigens in the stool. Test results are intended to aid the diagnosis of H. Pylori infection, and to monitor response during and post therapy.

The Doctor's Data stool test showed 3+ for Citrobacter freundii, and only a 1+ for Lactobacillus. She had some commensal imbalanced bacteria, no fungal overgrowth, no H. pylori, no parasites.



Comprehensive Stool Analysis / Parasitology x3

DIGESTION /ABSORPTION

	Within	Outside	Reference Range
Elastase	489		> 200 µg/mL
Fat Stain	Few		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*	< 10		<= 50 µg/g
Lysozyme*	259		<= 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*		225	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.

SHORT CHAIN FATTY ACIDS

	Within	Outside	Reference Range
% Acetate	64		40 - 75 %
% Propionate	17		9 - 29 %
% Butyrate	17		9 - 37 %
% Valerate	2.0		0.5 - 7 %
Butyrate	1.2		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	Rare		None - Rare
pH	6.8		6 - 7.8
Occult Blood	Neg		Neg

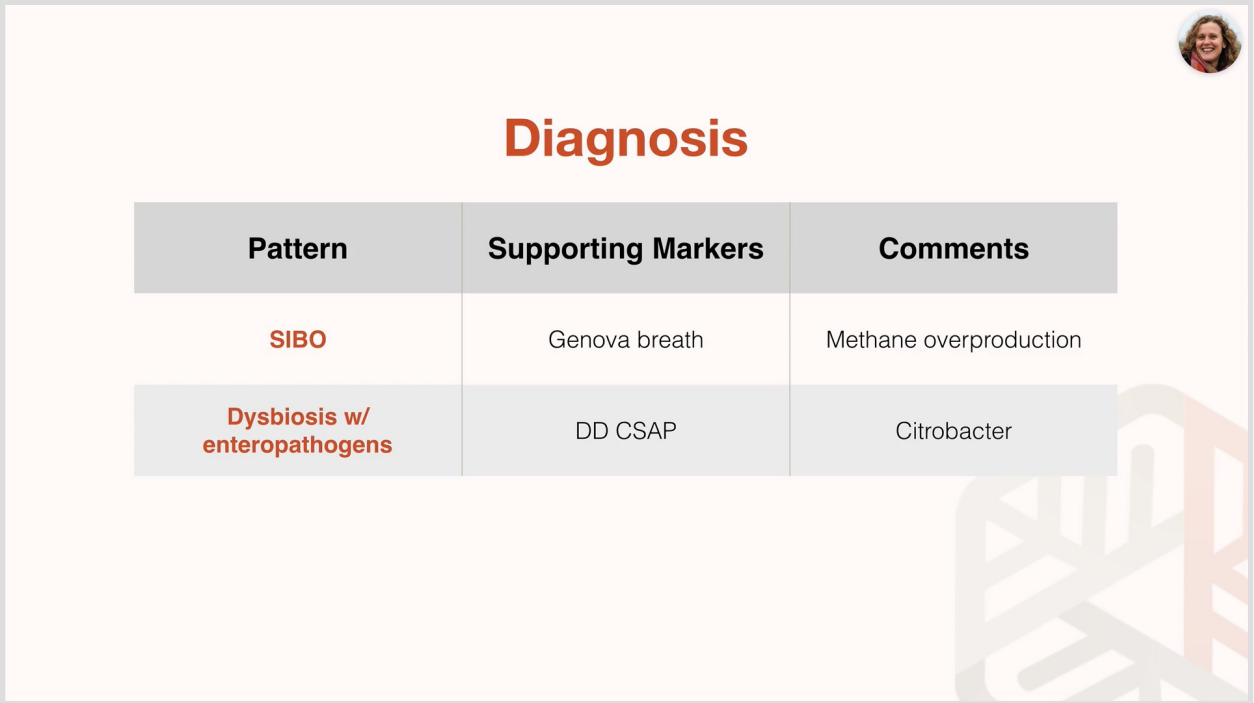
Red Blood Cells (RBC) in the stool may be associated with a parasitic or bacterial infection, or an inflammatory bowel condition such as ulcerative colitis. Colorectal cancer, anal fistulas, and hemorrhoids should also be ruled out.
pH: Fecal pH is largely dependent on the fermentation of fiber by the 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.

Not much to see on the next pages of the Doctor's Data stool test, other than slightly elevated secretory IgA.



Diagnosis

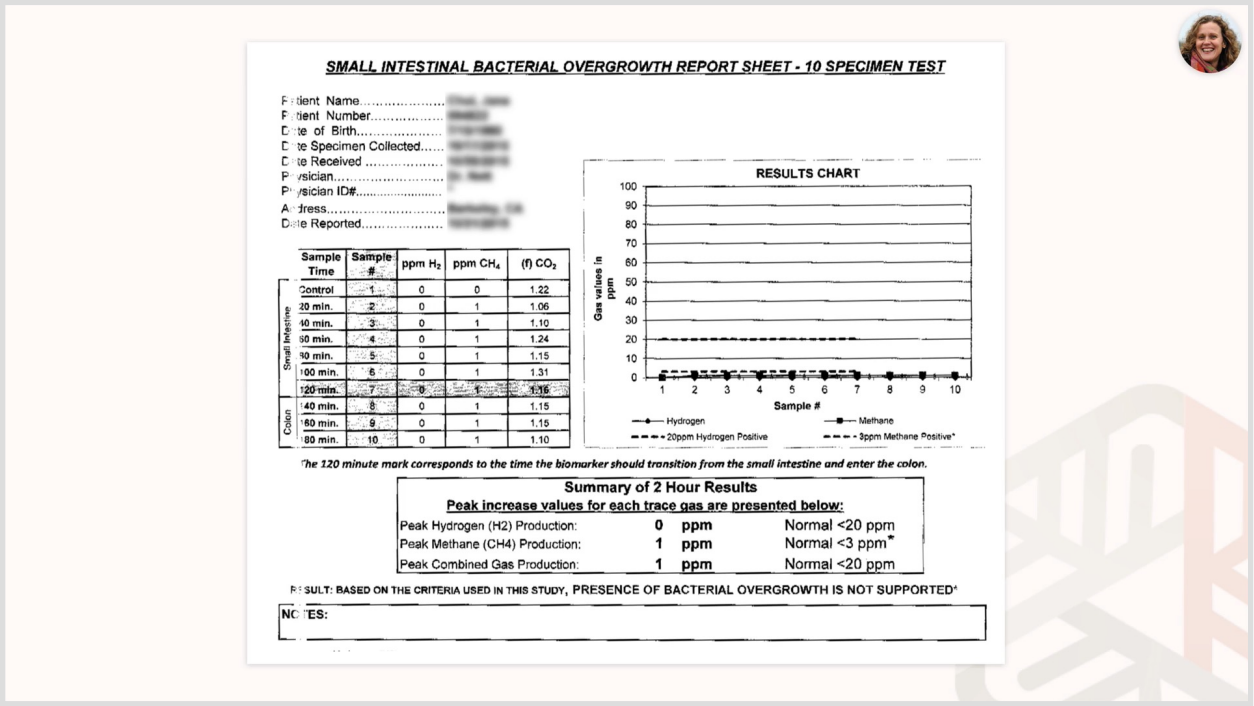
Pattern	Supporting Markers	Comments
SIBO	Genova breath	Methane overproduction
Dysbiosis w/ enteropathogens	DD CSAP	Citrobacter

Diagnosis, pretty basic, SIBO based on the Genova breath tests, methane overproduction, gut dysbiosis with enteropathogens, the Citrobacter we saw on the Doctor's Data panel.

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
Ideal Bowel Support	L. plantarum for methanogens

So we did a core botanical protocol with one addition of Lactobacillus plantarum, Ideal Bowel Support for methane overproduction. We did only 30 days because everything was pretty mild, and in fact, you could make an argument for not doing any treatment based on these results. They really were not strong, but the patient was pretty motivated, somewhat of a mystery what was causing her nasal congestion, and we did have some positive findings here, so she was willing to give it a try.



SMALL INTESTINAL BACTERIAL OVERGROWTH REPORT SHEET - 10 SPECIMEN TEST

Patient Name.....
Patient Number.....
Date of Birth.....
Date Specimen Collected.....
Date Received .....
Physician.....
Physician ID#.....
Address.....
Date Reported.....

	Sample Time	Sample #	ppm H_2	ppm CH_4	(f) CO_2
Small Intestine	Control	1	0	0	1.22
	20 min.	2	0	1	1.06
	40 min.	3	0	1	1.10
	80 min.	4	0	1	1.24
	90 min.	5	0	1	1.15
	100 min.	6	0	1	1.31
	120 min.	7	0	1	1.16
Colon	140 min.	8	0	1	1.15
	160 min.	9	0	1	1.15
	180 min.	10	0	1	1.10

RESULTS CHART

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

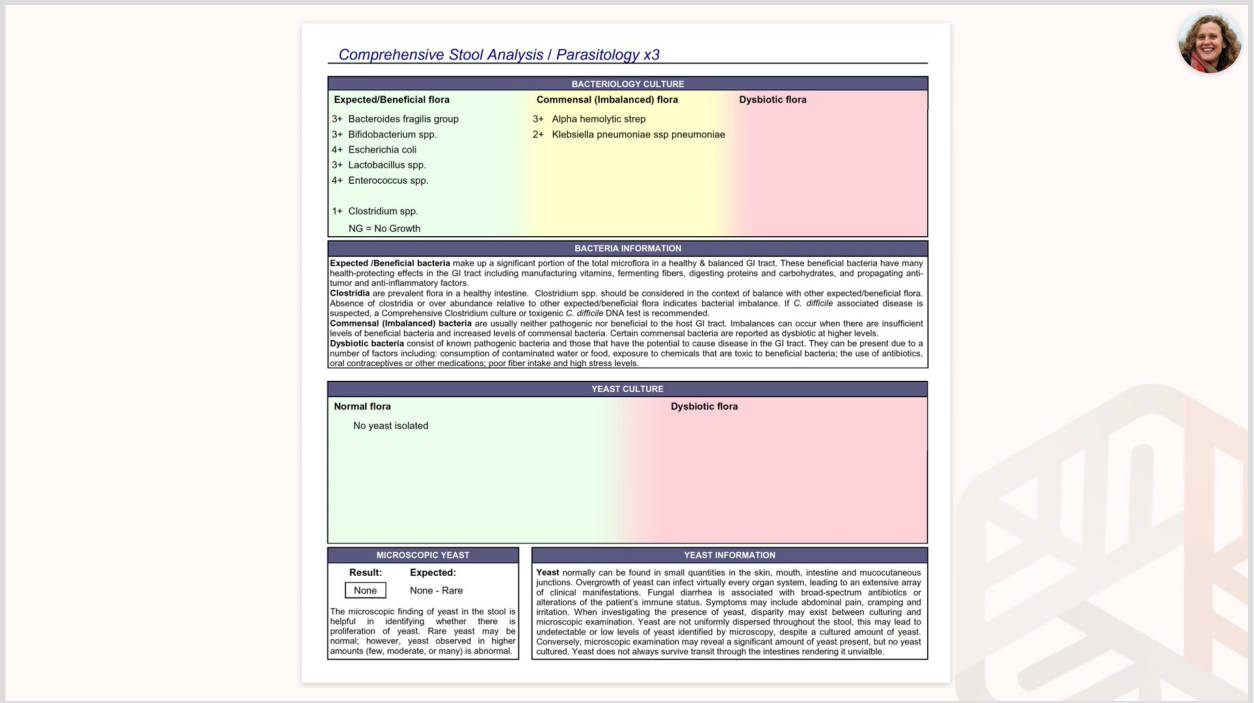
Summary of 2 Hour Results
Peak increase values for each trace gas are presented below:

Peak Hydrogen (H2) Production:	0 ppm	Normal <20 ppm
Peak Methane (CH4) Production:	1 ppm	Normal <3 ppm*
Peak Combined Gas Production:	1 ppm	Normal <20 ppm

RESULT: BASED ON THE CRITERIA USED IN THIS STUDY, PRESENCE OF BACTERIAL OVERGROWTH IS NOT SUPPORTED*

NOTES:

SIBO breath test results, hydrogens were zeroes, methane was zero or one throughout the whole test.



Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
3+ Bacteroides fragilis group	3+ Alpha hemolytic strep	
3+ Bifidobacterium spp.	2+ Klebsiella pneumoniae ssp pneumoniae	
4+ Escherichia coli		
3+ Lactobacillus spp.		
4+ 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
No yeast isolated	

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

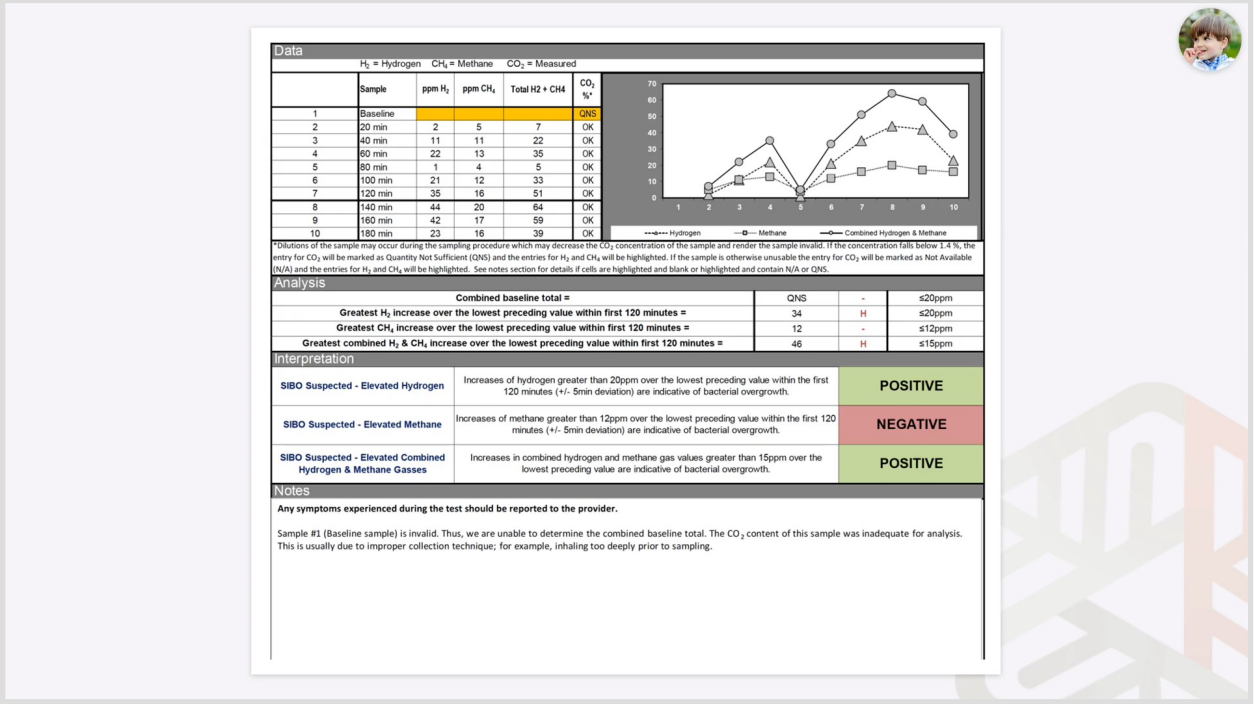
Yeast normally can be found in small quantities in the skin, mouth, intestine and mucocutaneous junctions. Overgrowth of yeast can infect virtually every organ system, leading to an extensive array of clinical manifestations. Fungal diarrhea is associated with broad-spectrum antibiotics or alterations 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.

Redid the Doctor's Data stool panel, beneficial bacteria improved a lot, Citrobacter was gone, still a couple of commensal imbalance species, but not a problem given her beneficial bacteria.

Unfortunately, her nasal congestion didn't improve at all, so it just tells us it wasn't gut-related, and we went on to explore other causes. Turns out she had significant mercury toxicity and was also living in a moldy house. She also saw a dental orthopedist, who moved her lower jaw forward, and that had a really dramatic effect, and this is something you can feel free to ask me about in the Q&As; we're not going to cover it in any detail, but this dental orthopedic work can have a pretty significant impact for sinus-related issues. So remember, we're covering three or four of the core pathologies that contribute to disease in this training; gut issues are certainly at the root of many problems, but not all of the problems you're going to see.

CASE #11: 4-YEAR-OLD MALE

All right, last patient we're going to talk about is a four-year-old male. His parent's chief complaints, of course, were ADHD, possible Asperger's, constipation, food allergies, environmental allergies, and skin rashes for this little guy. It was a fairly classic presentation for a young child with behavioral or attention disorders. He did have some improvement with a Paleo type of diet, but they had a hard time adhering to it with him given the behavioral issues.



Data

H_2 = Hydrogen CH_4 = Methane CO_2 = Measured

	Sample	ppm H_2	ppm CH_4	Total H2 + CH4	CO_2 %*
1	Baseline				QNS
2	20 min	2	5	7	OK
3	40 min	11	11	22	OK
4	60 min	22	13	35	OK
5	80 min	1	4	5	OK
6	100 min	21	12	33	OK
7	120 min	35	16	51	OK
8	140 min	44	20	64	OK
9	160 min	42	17	59	OK
10	180 min	23	16	39	OK

*Dilutions of the sample may occur during the sampling procedure which may decrease the CO_2 concentration of the sample and render the sample invalid. If the concentration falls below 1.4 %, the entry for CO_2 will be marked as Quantity Not Sufficient (QNS) and the entries for H_2 and CH_4 will be highlighted. If the sample is otherwise unusable the entry for CO_2 will be marked as Not Available (N/A) and the entries for H_2 and CH_4 will be highlighted. See notes section for details if cells are highlighted and blank or highlighted and contain N/A or QNS.

Analysis

Combined baseline total =	QNS	-	≤20ppm
Greatest H_2 increase over the lowest preceding value within first 120 minutes =	34	H	≤20ppm
Greatest CH_4 increase over the lowest preceding value within first 120 minutes =	12	-	≤12ppm
Greatest combined H_2 & CH_4 increase over the lowest preceding value within first 120 minutes =	46	H	≤15ppm

Interpretation

SIBO Suspected - Elevated Hydrogen	Increases of hydrogen greater than 20ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	POSITIVE
SIBO Suspected - Elevated Methane	Increases of methane greater than 12ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	NEGATIVE
SIBO Suspected - Elevated Combined Hydrogen & Methane Gasses	Increases in combined hydrogen and methane gas values greater than 15ppm over the lowest preceding value are indicative of bacterial overgrowth.	POSITIVE

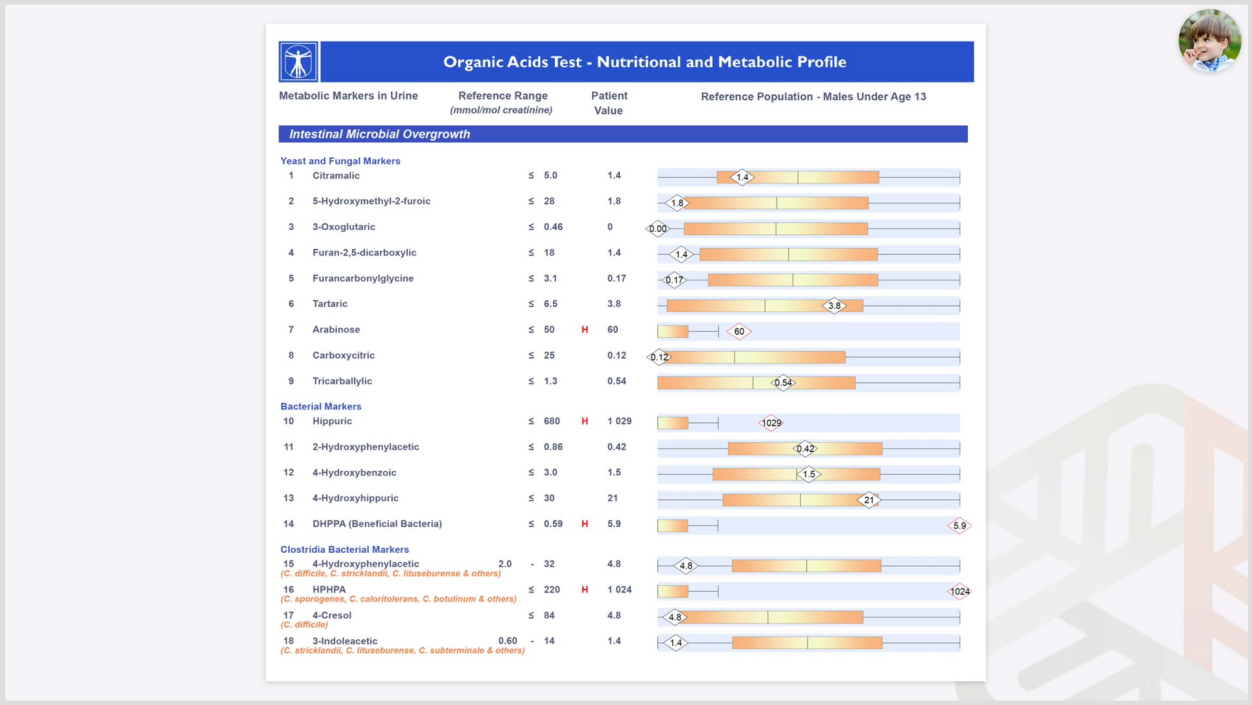
Notes

Any symptoms experienced during the test should be reported to the provider.

Sample #1 (Baseline sample) is invalid. Thus, we are unable to determine the combined baseline total. The CO_2 content of this sample was inadequate for analysis. This is usually due to improper collection technique; for example, inhaling too deeply prior to sampling.

He was positive for SIBO. Constipation makes it really unlikely that lactulose was already in his colon by 120 minutes when the hydrogen was up at 35 and methane was at 16. Methane was positive according to Pimentel criteria, even though it was not positive according to the Quintron criteria. Not sure what to make of sample number five, where he goes from a hydrogen of 22 at 60 minutes to one at 80 minutes, and then goes from a methane of 13 to a methane of 4, so there's a pronounced dip there as you can see in the chart. It's possible that he didn't blow into the tube correctly, or it's also possible that this is a kind of double peak, where he has an initial rise at 60 minutes, and then once it passes that area of overgrowth, it drops back down again and then it goes into the colon at 100 minutes, and that's very possible as well, so that would be

a double peak and more likely to be positive. The other possibility is that the patient didn't blow into the tube correctly, and he did have an invalid sample at sample number one, so that increases the likelihood, but they would typically mark it as invalid if that were the case.



Organic Acids Test - Nutritional and Metabolic Profile

	Metabolic Markers in Urine	Reference Range (mmol/mol creatinine)		Patient Value
	Intestinal Microbial Overgrowth			
	Yeast and Fungal Markers			
1	Citramalic	≤ 5.0		1.4
2	5-Hydroxymethyl-2-furoic	≤ 28		1.8
3	3-Oxoglutaric	≤ 0.46		0
4	Furan-2,5-dicarboxylic	≤ 18		1.4
5	Furancarbonylglycine	≤ 3.1		0.17
6	Tartaric	≤ 6.5		3.8
7	Arabinose	≤ 50	H	60
8	Carboxycitric	≤ 25		0.12
9	Tricarballylic	≤ 1.3		0.54
	Bacterial Markers			
10	Hippuric	≤ 680	H	1 029
11	2-Hydroxyphenylacetic	≤ 0.86		0.42
12	4-Hydroxybenzoic	≤ 3.0		1.5
13	4-Hydroxyhippuric	≤ 30		21
14	DHPPA (Beneficial Bacteria)	≤ 0.59	H	5.9
	Clostridia Bacterial Markers			
15	4-Hydroxyphenylacetic (*C. difficile, C. stricklandii, C. lituseburense & others*)	2.0 - 32		4.8
16	HPHPA (*C. sporogenes, C. caloritolerans, C. botulinum & others*)	≤ 220	H	1 024
17	4-Cresol (*C. difficile*)	≤ 84		4.8
18	3-Indoleacetic (*C. stricklandii, C. lituseburense, C. subterminale & others*)	0.60 - 14		1.4

Reference Population - Males Under Age 13

As I mentioned before, I'll often order the Great Plains organic acids test for kids or adults with behavioral issues, because it has more markers for clostridial species that are often associated with these kinds of problems, also more fungal markers, because they're also associated with these kinds of problems. So as you can see in this case, he had elevated levels of HPHPA; this is an abnormal phenylalanine metabolite produced when byproducts of Clostridium bacteria combine with human metabolites. It inhibits the metabolism of dopamine to epinephrine, high levels of homovanillate and low levels of epinephrine or norepinephrine can lead to altered behavior, especially hyper-reactivity. And you can note that his value's almost five times the upper limit of the lab range, so upper limit was 220 and he was 1,024. His hippuric acid was a little bit elevated and his arabinose was a little bit elevated as well, although I'm not certain about how those are impacting the clinical picture.

GI Pathogen Screen - 401

Parameter	Result
***** Stool Culture *****	
Preliminary Report	Normal flora after 24 hours
Final Report	* Escherichia coli isolated *
Amount of Growth	Abundant
***** 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	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

The BioHealth stool test was unremarkable.

Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
4+ Bacteroides fragilis group	1+ Enterobacter cloacae complex	
3+ Bifidobacterium spp.		
3+ Escherichia coli		
4+ Lactobacillus spp.		
4+ Enterococcus spp.		
NG 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 albicans	2+ Saccharomyces cerevisiae/boulardii

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.

PARASITOLOGY/MICROSCOPY *

Sample 1
None Ova or Parasites
Few RBC

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 Microsporidia spp.

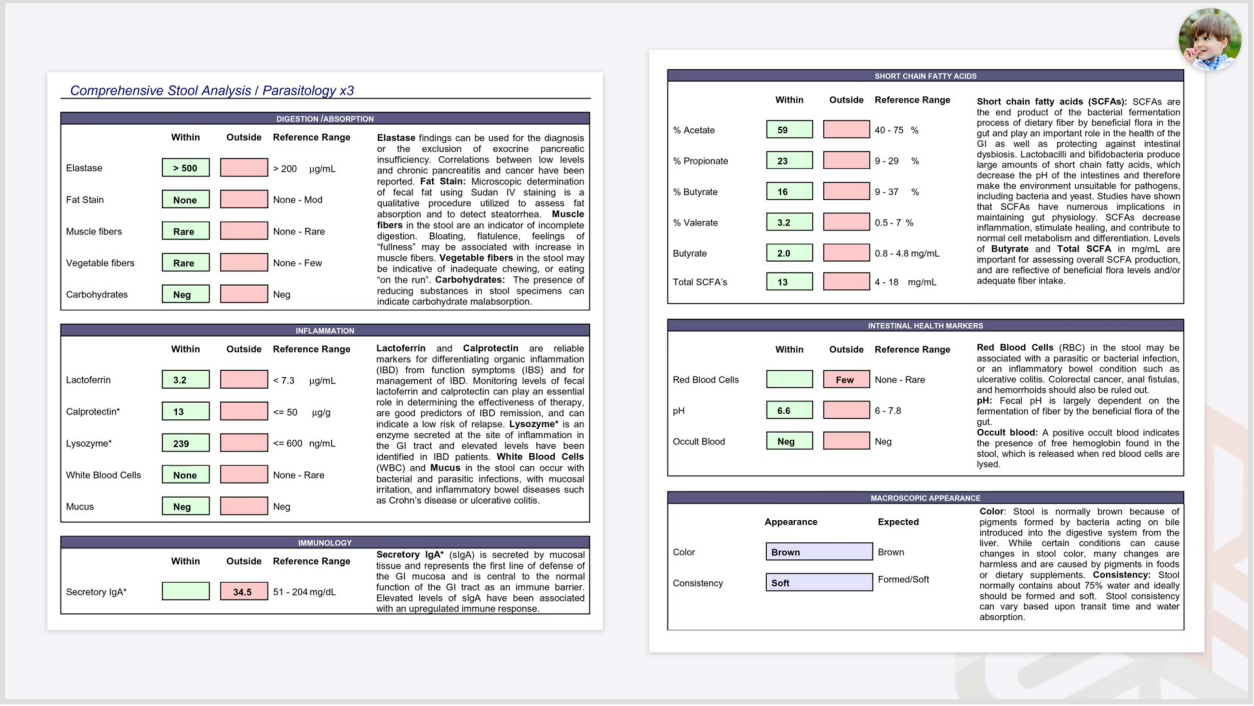
GIARDIA/CRYPTOSPORIDIUM IMMUNOASSAY

	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.

The Doctor's Data stool test, his beneficial bacteria was pretty good, which is unusual in a case like this, and he only had a 1+ for commensal bacteria, no dysbiotic flora, but the yeast section was a little tricky here. He had a 2+ listed in the dysbiotic flora section for Saccharomyces

cerevisiae or boulardii, but he was taking that as a supplement prior to the test, so it's unlikely that that's pathogenic even though it's listed in the pathogenic column, so you have to be aware of that. He had a 1+ for candida, and then it listed "few" in the microscopy section. Now, while "few" is considered abnormal, the problem is we don't know whether the few is referring to Candida albicans, which is listed in the normal flora section, or Saccharomyces boulardii. We might assume it was the S. boulardii since the culture found it in greater amounts than candida, but it's hard to say. Parasitology was normal.



Comprehensive Stool Analysis / Parasitology x3

DIGESTION /ABSORPTION

	Within	Outside	Reference Range
Elastase	> 500		> 200 µg/mL
Fat Stain	None		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
Lactoferrin	3.2		< 7.3 µg/mL
Calprotectin*	13		<= 50 µg/g
Lysozyme*	239		<= 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*		34.5	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.

SHORT CHAIN FATTY ACIDS

	Within	Outside	Reference Range
% Acetate	59		40 - 75 %
% Propionate	23		9 - 29 %
% Butyrate	16		9 - 37 %
% Valerate	3.2		0.5 - 7 %
Butyrate	2.0		0.8 - 4.8 mg/mL
Total SCFA's	13		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		Few	None - Rare
pH	6.6		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.

Then the second pages, the only thing that was out of range was secretory IgA, it was a little bit low, and then he had some red blood cells in the stool, indicating inflammation.

Diagnosis

Pattern	Supporting Markers	Comments
SIBO	Genova breath	Hydrogen and methane
Dysbiosis with clostridial overgrowth	GPL OAT	Neurotransmitter disruption
Possible fungal overgrowth	DD CSAP; GPL OAT	Inconclusive

So the diagnosis was SIBO, both hydrogen and methane based on the breath tests, dysbiosis with clostridial overgrowth based on the Great Plains organic acid test, which was leading to neurotransmitter disruption and probably contributing to his behavioral issues, and then possible fungal overgrowth showed up on both Doctor's Data and the Great Plains lab.

Treatment protocol

Nutraceutical	Dosage
Biocidin	1 drop for every 10 lbs bodyweight, QD ½ hour before meals
Lauricidin	Start with 1-3 pellets/day for a several days; increase to 10 pellets 3x/d
A-FNG	1 drop for every 10 lbs bodyweight, QD ½ hour before meals
Prescript Assist	½ capsule upon rising and before bed
MegaSporeBiotic	½ capsule upon rising and before bed
Ideal Bowel Support	1 capsule per day

So we did a pediatric botanical protocol; this was part of the treatment protocols section from earlier: biocidin, lauricidin, A-FNG, Prescript-Assist, MegaSporeBiotic and Ideal Bowel Support. We did this for 21 days; kids often respond faster than adults. He was a pretty new patient, so we don't have any retest results back yet, but I got a note from his mom and he had improved significantly during and after the protocol, less distracted, more consistent bowel movements, skin was better, allergies lessened, he was bedwetting before, I don't think I mentioned that on the previous slide, but that had improved significantly as well.

Okay, that is it for gut case studies and for the gut unit overall, so hope you got a lot out of that, and I'm really looking forward to diving into the HPA axis. We've got a lot of really interesting material to cover, and I think you're going to find it's a fresh perspective on a topic that really badly needed some updated scientific evidence-based approach.

Treatment and Interpretation Updates

Nutraceutical	Dosage
SEED Daily Synbiotic	1 (peds dose) to 3 capsule at bedtime
TerraFlora	½ (peds dose) to full capsule at lunch

Lab Test	Interpretation Criteria Change
SIBO Breath Test	North American Consensus CH4 ≥ 10 ppm at any point during test H2 ≥ 20 ppm before 90 min

On this slide I've listed some of the updates and changes that we've made to the gut treatment plans overtime. These recommendations have all been discussed in the previous week's curriculum. We are using SEED Daily Synbiotic and Terraflora instead of Prescript-Assist and some other probiotics mentioned in the treatment protocol throughout the case study presentation. The primary difference in terms of the breath test interpretation is that we are using the North American Consensus criteria for interpreting the breath test, which I was already pretty close to even before that was published. Refer to the curriculum itself for the most updated treatment protocols, but these case studies are still valuable. The approaches that we were using were obviously still quite effective, as you can see based on the case study results, but, as I hope is the case with all of you, I'm constantly seeking to improve and increase the efficacy of the protocols.

Ok, that's it for now. Thanks for listening. I'll see you next time.