KRESSER INSTITUTE
FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

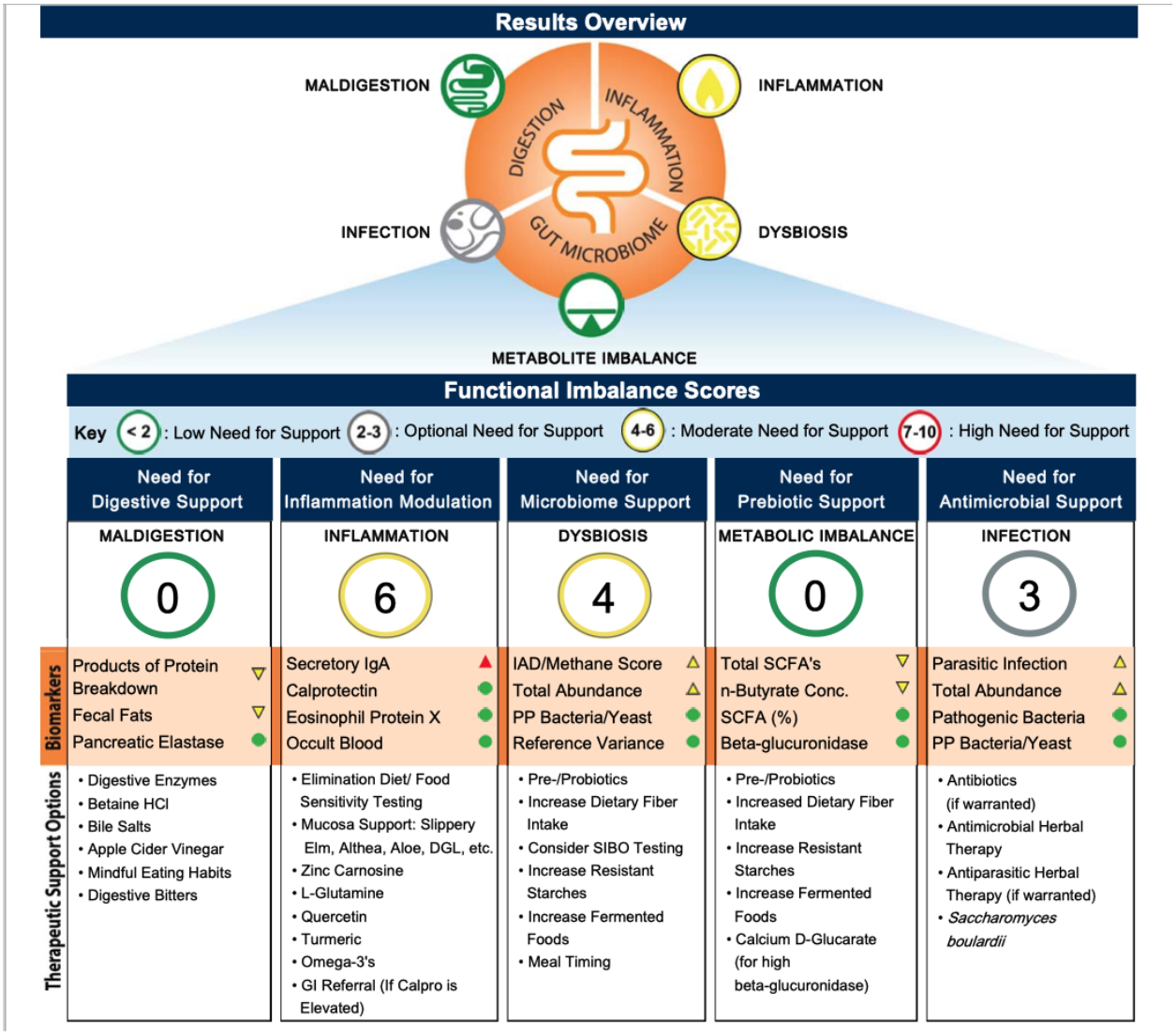
Gut Diagnosis: Stool Testing Case Assignments

Please review the following case studies and evaluate them to the best of your ability. You should treat these case studies as if they were your own patients and determine what treatment protocol to recommend. Don't worry; you won't have to turn in your answers for a grade. These assignments should be treated as more of a self-study tool to help you measure your progress throughout the course. We have also provided an answer key detailing the treatment protocol recommended by Chris and his staff for your comparison.

You may also want to discuss the cases with others in the Forum.

Case 1

A 28-year-old female has primary concerns of irritable bowel syndrome mixed type (IBS-M) with bloating, autoimmune thyroiditis, eczema, hair loss, weight gain, hormone concerns, and fatigue.



2200 GI Effects™ Comprehensive Profile - Stool

Methodology: GC-FID, Automated Chemistry, EIA

	Result	QUINTILE DISTRIBUTION (1st | 2nd | 3rd | 4th | 5th)	Reference Range
Digestion and Absorption			
Pancreatic Elastase 1 †	342	100 / 200	>200 mcg/g
Products of Protein Breakdown (Total*) (Valerate, Isobutyrate, Isovalerate)	0.7 L		1.8-9.9 micromol/g
Fecal Fat (Total*)	5.5		3.2-38.6 mg/g
Triglycerides	0.4		0.3-2.8 mg/g
Long-Chain Fatty Acids	2.8		1.2-29.1 mg/g
Cholesterol	1.6		0.4-4.8 mg/g
Phospholipids	0.7		0.2-6.9 mg/g
Inflammation and Immunology			
Calprotectin †	<16	50 / 120	<=50 mcg/g
Eosinophil Protein X (EPX)†	<DL	1.1 / 4.6	<=4.6 mcg/g
Fecal secretory IgA	4,152 H	680 / 2040	<=2,040 mcg/mL
Gut Microbiome Metabolites			
Metabolic			
Short-Chain Fatty Acids (SCFA) (Total*) (Acetate, n-Butyrate, Propionate)	34.9		>=23.3 micromol/g
n-Butyrate Concentration	6.8		>=3.6 micromol/g
n-Butyrate %	19.5		11.8-33.3 %
Acetate %	52.7		48.1-69.2 %
Propionate %	27.8		<=29.3 %
Beta-glucuronidase	726		368-6,266 U/g

Parasitology

PCR Parasitology - Protozoa

Methodologies: DNA by PCR, Next Generation Sequencing

Organism	Result	Units		Expected Result
Blastocystis spp.	1.13e3	femtograms/microliter C&S stool	Detected	Not Detected
Cryptosporidium parvum/hominis	<1.76e2	genome copies/microliter C&S stool	Not Detected	Not Detected
Cyclospora cayetanensis	<2.65e2	genome copies/microliter C&S stool	Not Detected	Not Detected
Dientamoeba fragilis	<1.84e2	genome copies/microliter C&S stool	Not Detected	Not Detected
Entamoeba histolytica	<9.64e1	genome copies/microliter C&S stool	Not Detected	Not Detected
Giardia	<1.36e1	genome copies/microliter C&S stool	Not Detected	Not Detected

Blastocystis spp. Reflex Subtyping

Type 1:	Not Detected	Type 4:	Not Detected	Type 7:	Not Detected
Type 2:	Not Detected	Type 5:	Not Detected	Type 8:	Not Detected
Type 3:	Detected	Type 6:	Not Detected	Type 9:	Not Detected

Additional Results

Methodology: Fecal Immunochemical Testing (FIT)

	Result	Expected Value
Fecal Occult Blood◆	Negative	Negative
Color††	Brown	
Consistency††	Not Given	

††Results provided from patient input.

Tests were developed and their performance characteristics determined by Genova Diagnostics. Unless otherwise noted with ◆, the assays have not been cleared by the U.S. Food and Drug Administration.

Case 2

A 45-year-old male has fatigue, heartburn, “undigested food in stool,” food intolerances, diarrhea, and bloating intermittent.

Diagnostic Solutions laboratory

GI-MAP ™ DNA Stool Analysis

H. pylori			
	Result		Normal
Helicobacter pylori	**4.1e3**	**High**	<1.0e3
Virulence Factor, babA	**Negative**		Negative
Virulence Factor, cagA	**Negative**		Negative
Virulence Factor, dupA	**Negative**		Negative
Virulence Factor, iceA	**Negative**		Negative
Virulence Factor, oipA	**Negative**		Negative
Virulence Factor, vacA	**Negative**		Negative
Virulence Factor, virB	**Negative**		Negative
Virulence Factor, virD	**Negative**		Negative

Normal Bacterial Flora			
	Result		Normal
Bacteroides fragilis	**2.38e11**		1.60e9 - 2.50e11
Bifidobacterium spp.	**8.93e10**		>6.70e7
Enterococcus spp.	**2.66e5**		1.9e5 - 2.00e8
Escherichia spp.	**4.61e7**		3.70e6 - 3.80e9
Lactobacillus spp.	**1.39e7**		8.6e5 - 6.20e8
Clostridia (class)	**3.50e7**		5.00e6 - 5.00e7
Enterobacter spp.	**3.34e7**		1.00e6 - 5.00e7
Akkermansia muciniphila	**6.38e5**	**High**	1.00e1 - 5.00e4
Faecalibacterium prausnitzii	**3.11e5**		1.00e3 - 5.00e8

Phyla Microbiota	Result		Normal
Bacteroidetes	**1.66e12**		8.61e11 - 3.31e12
Firmicutes	**4.80e11**	**High**	5.70e10 - 3.04e11
Firmicutes:Bacteroidetes Ratio	**0.29**		<1.00

2200 GI Effects™ Comprehensive Profile - Stool

Methodology: GC-FID, Automated Chemistry, EIA

	Result	QUINTILE DISTRIBUTION (1st | 2nd | 3rd | 4th | 5th)	Reference Range
Digestion and Absorption			
Pancreatic Elastase 1 †	354	100 / 200	>200 mcg/g
Products of Protein Breakdown (Total*) (Valerate, Isobutyrate, Isovalerate)	5.7		1.8-9.9 micromol/g
Fecal Fat (Total*)	21.0		3.2-38.6 mg/g
Triglycerides	0.7		0.3-2.8 mg/g
Long-Chain Fatty Acids	14.0		1.2-29.1 mg/g
Cholesterol	2.4		0.4-4.8 mg/g
Phospholipids	3.9		0.2-6.9 mg/g
Inflammation and Immunology			
Calprotectin †	<17	50 / 120	<=50 mcg/g
Eosinophil Protein X (EPX)†	<DL	1.1 / 4.6	<=4.6 mcg/g
Fecal secretory IgA	5,372 H	680 / 2040	<=2,040 mcg/mL
Gut Microbiome Metabolites			
Metabolic			
Short-Chain Fatty Acids (SCFA) (Total*) (Acetate, n-Butyrate, Propionate)	54.1		>=23.3 micromol/g
n-Butyrate Concentration	7.9		>=3.6 micromol/g
n-Butyrate %	14.6		11.8-33.3 %
Acetate %	59.4		48.1-69.2 %
Propionate %	26.1		<=29.3 %
Beta-glucuronidase	9,929 H		368-6,266 U/g

Add-on Testing

Methodology: EIA

	Result	Expected Value
HpSA - *H. pylori*	Positive	Negative

HpSA (*Helicobacter pylori* stool antigen)
Helicobacter pylori is a bacterium that causes peptic ulcer disease and plays a role in the development of gastric cancer. Direct stool testing of the antigen (HpSA) is highly accurate and is appropriate for diagnosis and follow-up of infection.

Diagnostic Solutions laboratory

GI-MAP ™ DNA Stool Analysis

Intestinal Health			
Digestion	Result		Normal
Steatocrit	**<dl**		<15 %
Elastase-1	**276**		>200 ug/g
GI Markers	Result		Normal
b-Glucuronidase	**4661**	**High**	<2486 U/mL
Occult Blood - FIT	**1**		<10 ug/g
Immune Response	Result		Normal
Secretory IgA	**1402**		510 - 2010 ug/g
Anti-gliadin IgA	**22**		0 - 157 U/L
Inflammation	Result		Normal
Calprotectin	**39**		<173 ug/g

Antibiotic Resistance Genes, phenotypes					
Helicobacter		**Result**			**Expected Result**
Amoxicillin		**Negative**			Negative
A926G	Absent	AGA926-928TTC	Absent		
Clarithromycin		**Negative**			Negative
A2142C	Absent	A2142G	Absent	A2143G	Absent
Fluoroquinolones		**Negative**			Negative
gyrA N87K	Absent	gyrA D91N	Absent	gyrA D91G	Absent
gyrB S479N	Absent	gyrB R484K	Absent		
Tetracycline		**Negative**			Negative
PBP1A S414R	Absent	PBP1A T556S	Absent	PBP1A N562Y	Absent
Antibiotic Resistance Genes, genotypes					
Universal Microbiota Resistance Genes					
b-lactamase		**Negative**			Negative
TEM-70	Absence	CTXM3	Absence	SHV-24	Absence
VEB-1	Absence	OXA-30	Absence	CTXM35	Absence
toho-3	Absence	CTXM63	Absence	PER-1	Absence
PER-2	Absence	GES-3	Absence	NDM-1	Absence
Fluoroquinolones		**Negative**			Negative
qnrA2	Absence	qnrB	Absence		
Macrolides		**Positive**			Negative
ermA	Absence	ermB	Presence	ermC	Absence
mefE	Presence				
Vancomycin		**Negative**			Negative
vanA1	Absence	vanA2	Absence	vanB	Absence
vanC	Absence				

Case 3

A 20-year-old female was diagnosed with Crohn's disease at age 16. She has been in a constant flare for the past year.

Diagnostic Solutions laboratory

GI-MAP ™ DNA Stool Analysis

H. pylori			
	Result		Normal
Helicobacter pylori	**<dl**		<1.0e3
Virulence Factor, babA	**N/A**		Negative
Virulence Factor, cagA	**N/A**		Negative
Virulence Factor, dupA	**N/A**		Negative
Virulence Factor, iceA	**N/A**		Negative
Virulence Factor, oipA	**N/A**		Negative
Virulence Factor, vacA	**N/A**		Negative
Virulence Factor, virB	**N/A**		Negative
Virulence Factor, virD	**N/A**		Negative

Normal Bacterial Flora			
	Result		Normal
Bacteroides fragilis	**6.82e8**	**Low**	1.60e9 - 2.50e11
Bifidobacterium spp.	**3.25e11**		>6.70e7
Enterococcus spp.	**1.52e9**	**High**	1.9e5 - 2.00e8
Escherichia spp.	**4.26e8**		3.70e6 - 3.80e9
Lactobacillus spp.	**1.60e10**	**High**	8.6e5 - 6.20e8
Clostridia (class)	**1.27e8**	**High**	5.00e6 - 5.00e7
Enterobacter spp.	**2.18e6**		1.00e6 - 5.00e7
Akkermansia muciniphila	**<dl**		1.00e1 - 5.00e4
Faecalibacterium prausnitzii	**<dl**		1.00e3 - 5.00e8

Phyla Microbiota	Result		Normal
Bacteroidetes	**7.04e10**	**Low**	8.61e11 - 3.31e12
Firmicutes	**4.91e11**	**High**	5.70e10 - 3.04e11
Firmicutes:Bacteroidetes Ratio	**6.98**	**High**	<1.00

Opportunistic Bacteria			
Additional Dysbiotic/Overgrowth Bacteria	Result		Normal
Bacillus spp.	**4.34e6**	**High**	<1.50e5
Enterococcus faecalis	**1.42e3**		<1.00e4
Enterococcus faecium	**3.32e2**		<1.00e4
Morganella spp.	**2.76e4**	**High**	<1.00e3
Pseudomonas spp.	**<dl**		<1.00e4
Pseudomonas aeruginosa	**<dl**		<5.00e2
Staphylococcus spp.	**<dl**		<1.00e4
Staphylococcus aureus	**8.13e2**	**High**	<5.00e2
Streptococcus spp.	**1.78e4**	**High**	<1.00e3
Methanobacteriaceae (family)	**8.59e7**		<5.00e9
Potential Autoimmune Triggers	Result		Normal
Citrobacter spp.	**<dl**		<5.00e6
Citrobacter freundii	**<dl**		<5.00e5
Klebsiella spp.	**<dl**		<5.00e3
Klebsiella pneumoniae	**5.06e2**		<5.00e4
M. avium subsp. paratuberculosis	**<dl**		<5.00e3
Prevotella spp.	**5.29e5**		<1.00e8
Proteus spp.	**<dl**		<5.00e4
Proteus mirabilis	**<dl**		<1.00e3
Fusobacterium spp.	**1.21e8**	**High**	<1.00e8
Fungi/Yeast			
	Result		Normal
Candida spp.	**<dl**		<5.00e3
Candida albicans	**<dl**		<5.00e2
Geotrichum spp.	**<dl**		<3.00e2
Microsporidium spp.	**<dl**		<5.00e3
Rodotorula spp.	**3.06e1**		<1.00e3
Viruses			
	Result		Normal
Cytomegalovirus	**<dl**		<1.00e5
Epstein Barr Virus	**<dl**		<1.00e7

Parasites			
Protozoa	Result		Normal
Blastocystis hominis	**<dl**		<2.00e3
Chilomastix mesnili	**<dl**		<1.00e5
Cyclospora spp.	**<dl**		<5.00e4
Dientamoeba fragilis	**1.57e3**		<1.00e5
Endolimax nana	**<dl**		<1.00e4
Entamoeba coli	**1.31e3**		<5.00e6
Pentatrichomonas hominis	**<dl**		<1.00e2
Worms	Result		Normal
Ancylostoma duodenale	**Not Detected**		Not Detected
Ascaris lumbricoides	**Not Detected**		Not Detected
Necator americanus	**Not Detected**		Not Detected
Trichuris trichiura	**Not Detected**		Not Detected
Taenia spp.	**Not Detected**		Not Detected
Intestinal Health			
Digestion	Result		Normal
Steatocrit	**<dl**		<15 %
Elastase-1	**504**		>200 ug/g
GI Markers	Result		Normal
b-Glucuronidase	**432**		<2486 U/mL
Occult Blood - FIT	**76**	**High**	<10 ug/g
Immune Response	Result		Normal
Secretory IgA	**1089**		510 - 2010 ug/g
Anti-gliadin IgA	**64**		0 - 157 U/L
Inflammation	Result		Normal
Calprotectin	**2486**	**High**	<173 ug/g

TESTS	RESULT	FLAG	UNITS	REFERENCE INTERVAL	LAB
Fe+TIBC+Fer					
Iron Bind.Cap.(TIBC)	410		ug/dL	250-450	
UIBC	392		ug/dL	131-425	01
Iron	**18**	**Low**	ug/dL	27-159	01
Iron Saturation	***4***	***Alert***	%	15-55	
Ferritin, Serum	**4**	**Low**	ng/mL	15-150	01
CBC With Differential/Platelet					
WBC	**18.7**	**High**	x10E3/uL	3.4-10.8	01
RBC	4.66		x10E6/uL	3.77-5.28	01
Hemoglobin	**9.1**	**Low**	g/dL	11.1-15.9	01
Hematocrit	**32.1**	**Low**	%	34.0-46.6	01
MCV	**69**	**Low**	fL	79-97	01
MCH	**19.5**	**Low**	pg	26.6-33.0	01
MCHC	**28.3**	**Low**	g/dL	31.5-35.7	01
RDW	**17.8**	**High**	%	11.7-15.4	01
Platelets	**629**	**High**	x10E3/uL	150-450	01
Neutrophils	88		%	Not Estab.	01
Lymphs	8		%	Not Estab.	01
Monocytes	2		%	Not Estab.	01
Eos	0		%	Not Estab.	01
Basos	0		%	Not Estab.	01
Neutrophils (Absolute)	**16.4**	**High**	x10E3/uL	1.4-7.0	01
Lymphs (Absolute)	1.6		x10E3/uL	0.7-3.1	01
Monocytes(Absolute)	0.4		x10E3/uL	0.1-0.9	01
C-Reactive Protein, Cardiac	0.75		mg/L	0.00-3.00	01
	Relative Risk for Future Cardiovascular Event				
			Low	<1.00	
			Average	1.00 - 3.00	
			High	>3.00	
Sedimentation Rate-Westergren					
	62	**High**	mm/hr	0-32	01
Copper, Serum [A]	153		ug/dL	80-158	02
				Detection Limit = 5	
	Please note reference interval change				

Source: Labcorp