Comprehensive Digestive Stool Analysis

GENOVA DIAGNOSTICS

63 Zillicoa Street
Asheville, NC 28801

Patient: RYAN MAIDENBERG
DOB: January 23, 1990
Sex: M
MRN: 1232524180

Order Number: I7081208
Completed: July 21, 2015
Received: July 08, 2015
Collected: July 07, 2015

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4126 Southwest Freeway
Suite 1030
Houston, TX 77027

Digestion

		Reference Range
Chymotrypsin	4.2	0.9-26.8 U/g
Putrefactive SCFAs (Total*)	3.9	1.3-8.6 micromol/g

* Total values equal the sum of all measurable parts.

	Inside	Outside	Reference Range
Meat Fibers	None		None
Vegetable Fibers	Rare		None - Few

Absorption

		Reference Range
Triglycerides	0.5	0.2-3.3 mg/g
Long Chain Fatty Acids	6.4	1.3-23.7 mg/g
Cholesterol	2.4	0.2-3.5 mg/g
Phospholipids	0.9	0.2-8.8 mg/g
Fecal Fat (Total*)	10.2	2.6-32.4 mg/g

* Total values equal the sum of all measurable parts.

Metabolic Markers

		Reference Range
Beneficial SCFAs (Total*)	38.7	>= 13.6 micromol/g
n-Butyrate	6.8	>= 2.5 micromol/g
Beta-Glucuronidase	2,207	337-4,433 U/g
pH	6.9	6.1-7.9

* Total values equal the sum of all measurable parts.

SCFA distribution

Acetate %	62.9	44.5-72.4 %
Propionate %	19.4	<= 32.1 %
n-Butyrate %	17.6	10.8-33.5 %

Immunology

	Inside	Outside	Reference Range
Fecal Lactoferrin ◆	Negative		Negative

Macroscopic

Color	Brown		Brown
Mucus	Negative		Negative
Occult blood ◆	Negative		Negative

Microbiology

Bacteriology

Beneficial Bacteria

Lactobacillus species	*NG
Escherichia coli	*NG
Bifidobacterium	4+

Additional Bacteria

alpha haemolytic Streptococcus	NP	3+
Klebsiella pneumoniae	PP	4+
Haemolytic Escherichia coli	NP	4+

Mycology

*NG *NG

*NG	NP	PP	P
*NG			
No Growth	Non-Pathogen	Possible Pathogen	Pathogen

Additional Tests (if indicated)

		Reference Range	In Range	Out of Range
Pancreatic Elastase ◆	433	> 200 mcg/g		
Eosinophil Protein X	1.0	<= 7.0 mcg/g		
Calprotectin ◆	<16	<=50 mcg/g		

Bile Acids

Lithocholic Acid (LCA)	4.36	0.65-5.21 mg/g
Deoxycholic Acid (DCA)	3.23	0.67-6.76 mg/g
LCA/DCA Ratio	1.35	0.39-2.07

	In Range	Out of Range
Campylobacter specific antigen ◆	Negative	
Shiga-like Toxin E. coli ◆	Negative	
Clostridium difficile ◆	Negative	
HpSA- H.pylori Stool Antigen	Negative	

Commentary

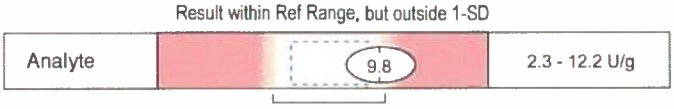
Lab Comments
***Requisition/Sample labeling discrepancy noted. Ordering physician has been contacted and authorizes testing to be performed. 07/16/2015 HH1*

The performance characteristics of all assays have been verified by Genova Diagnostics, Inc. Unless otherwise noted with ◆, the assay has not been cleared by the U.S. Food and Drug Administration.

Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or treatment recommendations. Diagnosis and treatment decisions are the responsibility of the practitioner.

The **Reference Range** is a statistical interval representing 95% or 2 Standard Deviations (2 S.D.) of the reference population.

One Standard Deviation (1 S.D.) is a statistical interval representing 68% of the reference population. Values between 1 and 2 S.D. are not necessarily abnormal. Clinical correlation is suggested. (See example below)



Human microflora is influenced by environmental factors and the competitive ecosystem of the organisms in the GI tract. Pathological significance should be based upon clinical symptoms and reproducibility of bacterial recovery.

Triglycerides constitute the major component of dietary fat and are normally broken down by pancreatic lipase into glycerol and free fatty acids. Triglycerides are within the reference range, indicating adequate fat digestion or a lack of dietary fat.

Chymotrypsin is within the reference range. Chymotrypsin is a key pancreatic enzyme that catalyzes protein digestion. Thus, the fecal level is a measure of proteolytic activity and a marker for pancreatic enzyme output as a whole. A value within the reference range suggests normal enzyme production. Levels are also influenced by transit time, such that faster transit results in higher fecal levels.

Valerate, iso-valerate and iso-butyrate are "putrefactive" short chain fatty acids, produced when anaerobic

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bacteria ferment undigested protein. Levels within the reference range suggest adequate protein digestion.

Long chain fatty acids (LCFAs) are within the reference range, suggesting adequate absorption of fats by the mucosa of the small intestine or a lack of dietary fat.

Cholesterol is within the reference range, suggesting adequate absorption of cholesterol by the small intestine or low dietary intake.

Phospholipids are normal. 50% of phospholipids are derived from bile, with 25% coming from mucosal desquamation and 25% from dietary sources. Nearly 85% of intestinal phospholipids are absorbed. Normal levels of fecal phospholipids indicate average dietary fat intake and adequate digestion/ absorption.

Total fecal fats are within the reference range. The total fecal fat is calculated as the sum of fecal triglycerides, phospholipids, cholesterol and long chain fatty acids.

Beneficial (Total) short chain fatty acids (SCFAs) are acetate, propionate and n-butyrate. They are the end products of anaerobic microbial fermentation of dietary fiber. Levels thus reflect the concentration of intestinal flora as well as soluble fiber in the diet. These beneficial SCFAs are crucial to the health of the intestine, serving as sources of fuel for the cells and the rest of the body. They also help to regulate the fluid balance in the colon.

n-Butyrate is the most important of the beneficial SCFAs, and is the primary energy source for colonic epithelial cells. Adequate amounts are necessary for the healthy metabolism of the colonic mucosa, and have been shown to have protective effects against colorectal cancers.

Beta-glucuronidase is within the reference range. This is an inducible enzyme, produced by E. coli and anaerobes Bacteroides, and Clostridia. Its activity reverses the detoxication of compounds processed in the hepatic Phase II glucuronidation pathway (including many pharmaceuticals, carcinogens, bile acids, and estrogen).

Fecal pH is within the reference range. The pH of the stool is a reflection of several factors in the GI tract, such as gastric acid, pancreatic bicarbonate, short chain fatty acids, ammonia, bile, organic acids, and acids produced by beneficial flora. Proper levels enhance colonization by beneficial flora, deter possible pathogens, promote normal digestive processes, and promote SCFA production.

The SCFA Distribution reflects the relative proportions of the beneficial SCFAs (n-butyrate, propionate, and acetate), thus providing an indirect measure of balance among the anaerobic organisms in the colon.

Sufficient amounts of Bifidobacteria appear to be present in the stool. However, Lactobacilli and E. coli were found in lower than optimal levels. The "friendly bacteria", Lactobacilli and Bifidobacteria, are important for gastrointestinal function, as they are involved in vitamin synthesis, natural antibiotic production, immune defense, digestion, detoxification of pro-carcinogens and a host of other activities. Reestablishing healthy levels of Lactobacilli may be desirable. E. coli have been noted at less than ample amounts in dysbiosis, and often rebound when intestinal imbalances are corrected. Ideally, levels of Lactobacillus and E. coli should be 2+ or greater. Bifidobacteria being a predominate anaerobe should be recovered at levels of 4+.

Klebsiella has been associated with diarrhea in humans, and is capable of translocating from the gut when in high numbers. Klebsiella appears to thrive in individuals on a high starch diet. Avoiding carbohydrates such as rice, potatoes, flour products and sugary foods reduces the amount of Klebsiella in the gut.

There is no detection of fecal lactoferrin. This indicates no active intestinal inflammation. However, non-inflammatory diarrhea caused by irritable bowel syndrome, small intestinal viral infections, non-invasive parasitic infections, or other etiologies may still be present even in the absence of lactoferrin.

Pancreatic Elastase 1 (PE1) is a simple, noninvasive method of assessing exocrine pancreatic function, contributing to a prompt and reliable diagnosis in suspected cases of pancreatic insufficiency. Reduced PE1 has been found in patients with diabetes, cholelithiasis and osteoporosis. PE1 has been shown to decline with age and can be used to monitor/adjust the dosage of pancreatic enzyme supplementation.

Eosinophil Protein X (EPX) reflects IgE-mediated inflammation. Fecal EPX elevations can be associated with several conditions including IBD, IgE-mediated food allergies, parasite or worm infections, and collagenous colitis. Elevated EPX requires further diagnostic testing to determine the cause.

Calprotectin is a neutrophilic marker specific for inflammation in the gastrointestinal tract. It may be elevated with IBD, post-infectious IBS, infection, food allergies, neoplasia and use of nonsteroidal anti-inflammatory drugs (NSAIDs). Fecal calprotectin is FDA-cleared to differentiate between IBD and IBS. Levels 50 mcg/g are considered

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normal; levels between 50-120 mcg/g are considered borderline and should be re-evaluated at 4-6 weeks; levels > 120 mcg/g are considered abnormal, the source of inflammation should be determined, and levels repeated as clinically indicated; and levels > 250 mcg/g have been associated with high risk of clinical relapse in patients with IBD.

Bile Acids: Colonic bacteria metabolize primary bile acids to secondary bile acids. Dietary fiber and bacteria flora determine the rates of metabolism for the secondary bile acids, lithocholic acid (LCA) and deoxycholic acid (DCA). The LCA:DCA ratio may be an important discriminating marker in colorectal cancer susceptibility. An elevated secondary bile acid ratio is associated with an increased risk of breast and colorectal cancer. Elevated levels may also occur in patients with gall stones and after cholecystectomy.

Clostridium difficile is an anaerobic, spore-forming gram-positive bacterium that can be part of the normal intestinal flora. After a disturbance of the gut flora (usually with antibiotics), colonization with toxin producing Clostridium difficile can take place. Diarrhea, as a result of Clostridium difficile infection and toxin production may be much more common as a cause of diarrhea than once thought.

HpSA (Helicobacter pylori stool antigen): Helicobacter pylori is a bacterium which 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.

Bacterial Sensitivity

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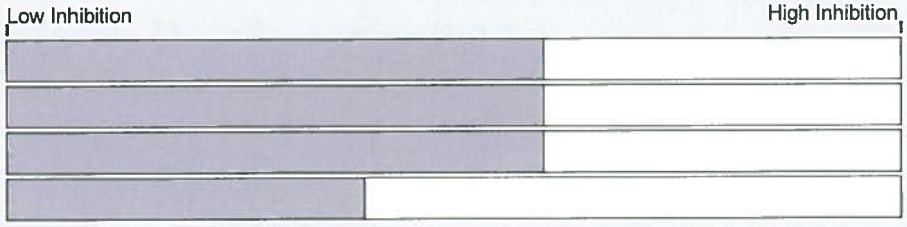
Prescriptive Agents

KLEBSIELLA PNEUMONIAE

	R	I	S-DD*	S	NI*
Ampicillin	R				
Amox./Clavulanic Acid				S	
Cephalothin				S	
Ciprofloxacin				S	
Tetracycline				S	
Trimethoprim/Sulfa				S	

Natural Agents

KLEBSIELLA PNEUMONIAE



Prescriptive Agents:
The R (Resistant) category implies isolate is not inhibited by obtainable levels of pharmaceutical agent.
The I (Intermediate) category includes isolates for which the minimum inhibition concentration (MIC) values usually approach obtainable pharmaceutical agent levels and for which response rates may be lower than for susceptible isolates.
* The S-DD (Susceptible-Dose Dependent) category implies clinical efficacy when higher than normal dosage of a drug can be used and maximal concentration acheived.
The S (Susceptible) column implies that isolates are inhibited by the usually achievable concentrations of the pharmaceutical agent.
* NI (No Interpretive guidelines established) category is used for organisms that currently do not have established guidelines for MIC interpretation.
Refer to published pharmaceutical guidelines for appropriate dosage therapy.

Natural Agents:
In this assay, inhibition is defined as the reduction level on organism growth as a direct result of inhibition by a substance. The level of inhibition is an indicator of how effective the substance was at limiting the growth of an organism in an in vitro environment. High inhibition indicates a greater ability by the substance to limit growth, while Low Inhibition a lesser ability to limit growth. The designated natural prodcuts should be considered investgational in nature and not be viewed as standard clinical treatment substances.
This test has been developed and its performance characteristics determined by Genova Diagnostics, Inc. It has not been cleared or approved by the U.S. Food and Drug Administration.