The Great Plains Laboratory, Inc.

CLIENT #: 24510

ORDER: 200514-0219
CLIENT REF: 800067
PATIENT: Robert Stehlin
ID: P201350180
SEX: Male
AGE: 56 DOB: 07/09/1963

Comprehensive Stool Analysis / Parasitology x2

BACTERIOLOGY CULTURE

Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
4+ *Bacteroides fragilis* group	1+ Beta hemolytic strep, group B	
NG *Bifidobacterium* spp.		
3+ *Escherichia coli*		
NG *Lactobacillus* spp.		
1+ *Enterococcus* spp.		
4+ *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

Yeast in stool is expected at a level of none-rare. A microscopic finding of yeast in stool of few, moderate, or many may be helpful in identifying potential yeast overgrowth, or non-viable or dietary yeast.

YEAST INFORMATION

Yeast may normally be present in small quantities in the skin, mouth, and intestine. When investigating the presence of yeast, disparity may exist between culturing and microscopic examination. Yeast are not uniformly dispersed throughout the stool and this may lead to undetectable or low levels of yeast identified by microscopy, despite culture and identified yeast species. Conversely, microscopic examination may reveal a significant amount of yeast present but no viable yeast cultured. Yeast may not always survive transit through the intestines. Nonviable diet-derived yeast may also be detected microscopically. Consideration of clinical intervention for yeast detected microscopically should be made in the context of other findings and presentation of symptoms.

SPECIMEN DATA

Comments:
Date Collected: 05/11/2020 05:00
Date Received: 05/14/2020 16:29
Date Reported: 05/22/2020 01:30
Methodology: Culture and identification by MALDI-TOF and conventional biochemicals

MALDI-TOF

*Aeromonas, Campylobacter, Plesiomonas, Salmonella, Shigella, Vibrio, Yersinia, & Edwardsiella tarda have been specifically tested for and found absent unless reported.

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Protozoa	PX1	PX2
Balantidium coli	Not Detected	Not Detected
Blastocystis spp.	Not Detected	Not Detected
Chilomastix mesnili	Not Detected	Not Detected
Dientamoeba fragilis	Not Detected	Not Detected
Endolimax nana	Not Detected	Not Detected
Entamoeba coli	Not Detected	Not Detected
Entamoeba hartmanni	Not Detected	Not Detected
Entamoeba histolytica/Entamoeba dispar	Not Detected	Not Detected
Entamoeba polecki	Not Detected	Not Detected
Enteromonas hominis	Not Detected	Not Detected
Giardia duodenalis	Not Detected	Not Detected
Iodamoeba bütschlii	Not Detected	Not Detected
Isospora belli	Not Detected	Not Detected
Pentatrichomonas hominis	Not Detected	Not Detected
Retortamonas intestinalis	Not Detected	Not Detected
Nematodes - Roundworms		
Ascaris lumbricoides	Not Detected	Not Detected
Capillaria hepatica	Not Detected	Not Detected
Capillaria philippinensis	Not Detected	Not Detected
Enterobius vermicularis	Not Detected	Not Detected
Strongyloides stercoralis	Not Detected	Not Detected
Trichuris trichiura	Not Detected	Not Detected
Hookworm	Not Detected	Not Detected
Cestodes - Tapeworms		
Diphyllobothrium latum	Not Detected	Not Detected
Dipylidium caninum	Not Detected	Not Detected
Hymenolepis diminuta	Not Detected	Not Detected
Hymenolepis nana	Not Detected	Not Detected
Taenia	Not Detected	Not Detected
Trematodes - Flukes		
Clonorchis sinensis	Not Detected	Not Detected
Fasciola hepatica/Fasciolopsis buski	Not Detected	Not Detected
Heterophyes heterophyes	Not Detected	Not Detected
Paragonimus westermani	Not Detected	Not Detected
Other Markers		
Yeast	Not Detected	Not Detected
RBC	Rare	Rare
WBC	Not Detected	Not Detected
Charcot-Leyden Crystals	Not Detected	Not Detected
Pollen	Not Detected	Not Detected

Immunoassay	RESULT	REFERENCE INTERVAL
Giardia duodenalis	Negative	Negative
Cryptosporidium	Negative	Negative

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.

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.

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

SPECIMEN DATA

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Methodology: Microscopy, Enzyme Immunoassay

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Comprehensive Stool Analysis / Parasitology x2

DIGESTION / ABSORPTION

	WITHIN	OUTSIDE	REFERENCE INTERVAL
Elastase	256		> 200 µg/mL
Fat Stain	None		None – Few
Muscle fibers	Rare		None – Rare
Vegetable fibers	Few		None – Few
Carbohydrates†	Negative		Negative

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 INTERVAL
Lactoferrin	1.4		< 7.3 µg/mL
Calprotectin	<10		≤ 50 µg/g
Lysozyme*	113		≤ 500 ng/mL
White Blood Cells	None		None – Rare
Mucus	Negative		Negative

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 INTERVAL
Secretory IgA*	33.0		30 – 275 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.

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Comments:
Date Collected: 05/11/2020 05:00
Date Received: 05/14/2020 16:29
Date Reported: 05/22/2020 01:30
Methodology: Elisa, Microscopy, Colormetric, Macroscopic Observation

*This test was developed and its performance characteristics determined by Doctor's Data Laboratories in a manner consistent with CLIA requirements. The U. S. Food and Drug Administration (FDA) has not approved or cleared this test; however, FDA clearance is not currently required for clinical use. The results are not intended to be used as a sole means for clinical diagnosis or patient management decisions.

†This test has been modified from the manufacturer's instructions and its performance characteristics determined by Doctor's Data Laboratories in a manner consistent with CLIA requirements.

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SHORT CHAIN FATTY ACIDS

	WITHIN	OUTSIDE	REFERENCE INTERVAL
% Acetate‡	54		50 – 72 %
% Propionate‡	16		11 – 25 %
% Butyrate‡	25		11 – 32 %
% Valerate‡	4.1		0.8 – 5.0 %
Butyrate‡	1.0		0.8 – 4.0 mg/mL
Total SCFA's‡		4.0	5.0 – 16.0 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 INTERVAL
Red Blood Cells	Rare		None – Rare
pH	6.5		5.8 – 7.0
Occult Blood	Negative		Negative

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

	WITHIN	OUTSIDE	EXPECTED
Color	Brown		Brown
Consistency	Soft		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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Methodology: Gas Chromotography, ph Electrode, Guaiac, Macroscopic Observation

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Introduction

This analysis of the stool specimen provides fundamental information about the overall gastrointestinal health of the patient. When abnormal microflora or significant aberrations in intestinal health markers are detected, specific commentaries are presented. If no significant abnormalities are found, commentaries are not presented.

Microbiology

Beneficial Flora

One or more of the expected or beneficial bacteria are low in this specimen. Normally abundant bacteria include Lactobacillus spp, Bifidobacteria spp, Clostridium spp, Bacteroides fragilis group, Enterococcus spp, and Escherichia coli. The beneficial flora have many health-protecting effects in the gut, and as a consequence, are crucial to the health of the whole organism. Some of the roles of the beneficial flora include digestion of proteins and carbohydrates, manufacture of vitamins and essential fatty acids, increase in the number of immune system cells, break down of bacterial toxins and the conversion of flavonoids into anti-tumor and anti-inflammatory factors. Lactobacilli, bifidobacteria, clostridia, and enterococci secrete lactic acid as well as other acids including acetate, propionate, butyrate, and valerate. This secretion causes a subsequent decrease in intestinal pH, which is crucial in preventing an enteric proliferation of microbial pathogens, including bacteria and yeast. Many GI pathogens thrive in alkaline environments. Lactobacilli also secrete the antifungal and antimicrobial agents lactocidin, lactobacillin, acidolin, and hydrogen peroxide. The beneficial flora of the GI tract have thus been found useful in the inhibition of microbial pathogens, prevention and treatment of antibiotic associated diarrhea, prevention of traveler's diarrhea, enhancement of immune function, and inhibition of the proliferation of yeast.

In a healthy balanced state of intestinal flora, the beneficial bacteria make up a significant proportion of the total microflora. Healthy levels of each of the beneficial bacteria are indicated by either a 2+, 3+ or 4+ (0 to 4 scale). However, in some individuals there is an imbalance or deficiency of beneficial flora and an overgrowth of non-beneficial (imbalance) or even pathogenic microorganisms (dysbiosis). This can be due to a number of factors including: consumption of contaminated water or food; daily exposure of chemicals that are toxic to beneficial bacteria; the use of antibiotics, oral contraceptives or other medications; poor fiber intake and high stress levels.

A number of toxic substances can be produced by the dysbiotic bacteria including amines, ammonia, hydrogen sulfide, phenols, and secondary bile acids which may cause inflammation or damage to the brush border of the intestinal lining. If left unchecked, long-term damage to the intestinal lining may result in leaky gut syndrome, fatigue, chronic headaches, and sensitivities to a variety of foods. In addition, pathogenic bacteria can cause acute symptoms such as abdominal pain, nausea, diarrhea, vomiting and fever in cases of food poisoning.

Antibacterial and antifungal susceptibility testing to a variety of prescriptive and natural agents may be provided for the pathogenic organisms that are cultured from this patient's specimen. This testing is intended to provide the practitioner with useful information to help plan an appropriate treatment regimen. A comprehensive program may be helpful in individuals in whom a dysbiotic condition has caused extensive GI damage.

Note: Not all genera or species can be tested for susceptibilities in the laboratory due to their specific growth requirements. In addition, the Centers for Disease Control and Prevention recommend not testing certain organisms such as those associated with food poisoning. If a practitioner has specific questions, please contact customer service.

Clostridium spp

Clostridia are expected inhabitants of the human intestine. Although most clostridia in the intestine are not virulent, certain species have been associated with disease. Clostridium perfringens is a major cause of food poisoning and is also one cause of antibiotic-associated diarrhea. Clostridium difficile is a causative agent in antibiotic-associated diarrhea and pseudomembranous colitis. Other species reported to be prevalent in high amounts in patients with Autistic Spectrum Disorder include Clostridium histolyticum group, Clostridium cluster I, Clostridium bolteae, and Clostridium tetani.

Imbalanced Flora

Imbalanced flora are those bacteria that reside in the host gastrointestinal tract and neither injure nor benefit the host. Certain dysbiotic bacteria may appear under the imbalanced category if found at low levels because they are not likely pathogenic at the levels detected. When imbalanced flora appear, it is not uncommon to find inadequate levels of one or more of the beneficial bacteria and/or a fecal pH more towards the alkaline end of the reference range (6 - 7.8). It is also not uncommon to find hemolytic or mucoid E. coli with a concomitant deficiency of beneficial E. coli and alkaline pH, secondary to a mutation of beneficial E. coli in alkaline conditions (DDI observations). Treatment with antimicrobial agents is unnecessary unless bacteria appear under the dysbiotic category.

Stool Chemistries

Short Chain Fatty Acids (SCFAs)

The total concentration and/or percentage distribution of the primary short chain fatty acids (SCFAs) are abnormal in this specimen. Beneficial bacteria that ferment non-digestible soluble fiber produce SCFAs that are pivotal in the regulation of intestinal health and function. Restoration of microbial abundance and diversity, and adequate daily consumption of soluble fiber can improve SCFA status.

Stool Chemistries continued...

The primary SCFAs butyrate, propionate and acetate are produced by predominant commensal bacteria via fermentation of soluble dietary fiber and intestinal mucus glycans. Key producers of SCFAs include Faecalibacterium prausnitzii, Akkermansia muciniphila, Bacteroides fragilis, Bifidobacterium, Clostridium and Lactobacillus species. The SCFAs provide energy for intestinal cells, and regulate the actions of specialized mucosal cells that produce anti-inflammatory and antimicrobial factors, mucins that constitute the mucus barriers, and gut active peptides that facilitate appetite regulation and euglycemia. The SCFAs also contribute to a more acidic and anaerobic microenvironment that disfavors dysbiotic bacteria and yeast. Abnormal SCFAs may be associated with dysbiosis (including insufficiency dysbiosis), compromised intestinal barrier function (intestinal permeability) and inappropriate immune and inflammatory conditions.

“Seeding” with supplemental probiotics may contribute to improved production and status of SCFAs, but it is imperative to “feed” the beneficial microbes. Sources of soluble fiber that are available to the microbes include chick peas, beans, lentils, oat and rice bran, fructo- and galacto- oligosaccharides, and inulin.