

ORDER: 999999-9999  
PATIENT: Sample Patient  
ID: 999999  
SEX:  
AGE:  
DOB:

CLIENT #: 999999  
DOCTOR: Sample Doctor ND  
Doctors Data Inc  
123 Main St.  
St. Charles, IL 60174 USA



Culture, PCR +Parasitology; stool

#### BACTERIOLOGY CULTURE

##### Expected/Beneficial flora

3+ *Bacteroides* family  
2+ *Bifidobacterium* family  
4+ *Escherichia coli*  
NG *Lactobacillus* family  
1+ *Enterococcus* family  
3+ *Clostridium* family

##### Commensal (Imbalanced) flora

1+ *Staphylococcus aureus*  
4+ *Streptococcus anginosus*  
4+ *Streptococcus parasanguinis*

##### Dysbiotic flora

3+ *Klebsiella pneumoniae*  
4+ *Pseudomonas aeruginosa*

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, review the *Clostridium difficile* toxin A/B results from the GI Pathogens PCR section of this report.

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

#### YEAST CULTURE

##### Normal flora

No yeast isolated

##### Dysbiotic flora



#### YEAST INFORMATION

Yeast may normally be present in small quantities in the skin, mouth, and GI tract as a component of the resident microbiota. Their presence is generally benign. Recent studies, however, show that high levels of yeast colonization is associated with several inflammatory diseases of the GI tract. Animal models suggest that yeast colonization delays healing of inflammatory lesions and that inflammation promotes colonization. These effects may create a cycle in which low-level inflammation promotes fungal colonization and this colonization promotes further inflammation. Consideration of clinical intervention for yeast should be made in the context of other findings and presentation of symptoms.

#### SPECIMEN DATA

##### Comments:

Date Collected:  
Date Received:  
Date Reported:

Specimens Collected: 3

Methodology: Culture and identification by MALDI-TOF and conventional biochemicals



ORDER: 999999-9999  
PATIENT: Sample Patient  
ID: 999999  
SEX:  
AGE:  
DOB:

CLIENT #: 999999  
DOCTOR: Sample Doctor ND  
Doctors Data Inc  
123 Main St.  
St. Charles, IL 60174 USA



GI Pathogens; Multiplex PCR

Viruses	Result		Reference Interval
Adenovirus F40/41	Negative	<input checked="" type="checkbox"/>	Negative
Norovirus GI/GII	Negative	<input checked="" type="checkbox"/>	Negative
Rotavirus A	Negative	<input checked="" type="checkbox"/>	Negative

Pathogenic Bacteria	Result		Reference Interval
<i>Campylobacter</i> ( <i>C. jejuni</i> , <i>C. coli</i> and <i>C. lari</i> )	Negative	<input checked="" type="checkbox"/>	Negative
<i>Clostridioides difficile</i> (Toxin A/B)	Negative	<input checked="" type="checkbox"/>	Negative
<i>Escherichia coli</i> O157	Negative	<input checked="" type="checkbox"/>	Negative
Enterotoxigenic <i>Escherichia coli</i> (ETEC) lt/st	Negative	<input checked="" type="checkbox"/>	Negative
<i>Salmonella</i> spp.	Negative	<input checked="" type="checkbox"/>	Negative
Shiga-like toxin-producing <i>Escherichia coli</i> (STEC) stx1/stx2	Negative	<input checked="" type="checkbox"/>	Negative
<i>Shigella</i> ( <i>S. boydii</i> , <i>S. sonnei</i> , <i>S. flexneri</i> & <i>S. dysenteriae</i> )	Negative	<input checked="" type="checkbox"/>	Negative
<i>Vibrio cholerae</i>	Negative	<input checked="" type="checkbox"/>	Negative

Parasites	Result		Reference Interval
<i>Cryptosporidium</i> ( <i>C. parvum</i> and <i>C. hominis</i> )	Negative	<input checked="" type="checkbox"/>	Negative
<i>Entamoeba histolytica</i>	Negative	<input checked="" type="checkbox"/>	Negative
<i>Giardia duodenalis</i> (AKA <i>intestinalis</i> & <i>lamblia</i> )	Negative	<input checked="" type="checkbox"/>	Negative

SPECIMEN DATA

Comments:

Date Collected:  
Date Received:  
Date Reported:  
Methodology: Multiplex PCR

Specimens Collected: 3



ORDER: 999999-9999  
 PATIENT: Sample Patient  
 ID: 999999  
 SEX:  
 AGE:  
 DOB:

CLIENT #: 999999  
 DOCTOR: Sample Doctor ND  
 Doctors Data Inc  
 123 Main St.  
 St. Charles, IL 60174 USA



Parasitology; Microscopy

Protozoa	Result	
<i>Balantidium coli</i>	Not Detected	<input type="checkbox"/>
<i>Blastocystis spp.</i>	Not Detected	<input type="checkbox"/>
<i>Chilomastix mesnili</i>	Not Detected	<input type="checkbox"/>
<i>Dientamoeba fragilis</i>	Not Detected	<input type="checkbox"/>
<i>Endolimax nana</i>	Not Detected	<input type="checkbox"/>
<i>Entamoeba coli</i>	Few Trophs	<input checked="" type="checkbox"/>
<i>Entamoeba hartmanni</i>	Not Detected	<input type="checkbox"/>
<i>Entamoeba histolytica/Entamoeba dispar</i>	Not Detected	<input type="checkbox"/>
<i>Entamoeba polecki</i>	Not Detected	<input type="checkbox"/>
<i>Enteromonas hominis</i>	Not Detected	<input type="checkbox"/>
<i>Giardia duodenalis</i>	Not Detected	<input type="checkbox"/>
<i>Iodamoeba bütschlii</i>	Not Detected	<input type="checkbox"/>
<i>Isospora belli</i>	Not Detected	<input type="checkbox"/>
<i>Pentatrichomonas hominis</i>	Not Detected	<input type="checkbox"/>
<i>Retortamonas intestinalis</i>	Not Detected	<input type="checkbox"/>
<b>Nematodes - Roundworms</b>		
<i>Ascaris lumbricoides</i>	Not Detected	<input type="checkbox"/>
<i>Capillaria hepatica</i>	Not Detected	<input type="checkbox"/>
<i>Capillaria philippinensis</i>	Not Detected	<input type="checkbox"/>
<i>Enterobius vermicularis</i>	Not Detected	<input type="checkbox"/>
<i>Strongyloides stercoralis</i>	Not Detected	<input type="checkbox"/>
<i>Trichuris trichiura</i>	Not Detected	<input type="checkbox"/>
Hookworm	Not Detected	<input type="checkbox"/>
<b>Cestodes - Tapeworms</b>		
<i>Diphyllobothrium latum</i>	Not Detected	<input type="checkbox"/>
<i>Dipylidium caninum</i>	Not Detected	<input type="checkbox"/>
<i>Hymenolepis diminuta</i>	Not Detected	<input type="checkbox"/>
<i>Hymenolepis nana</i>	Not Detected	<input type="checkbox"/>
<i>Taenia</i>	Not Detected	<input type="checkbox"/>

SPECIMEN DATA

Comments:

Date Collected:

Specimens Collected: 3

Date Received:

Date Reported:

Methodology: Microscopy

ORDER: 999999-9999  
 PATIENT: Sample Patient  
 ID: 999999  
 SEX:  
 AGE:  
 DOB:

CLIENT #: 999999  
 DOCTOR: Sample Doctor ND  
 Doctors Data Inc  
 123 Main St.  
 St. Charles, IL 60174 USA



Parasitology; Microscopy

Trematodes - Flukes		
<i>Clonorchis sinensis</i>	Not Detected	<input checked="" type="checkbox"/>
<i>Fasciola hepatica/Fasciolopsis buski</i>	Not Detected	<input checked="" type="checkbox"/>
<i>Heterophyes heterophyes</i>	Not Detected	<input checked="" type="checkbox"/>
<i>Paragonimus westermani</i>	Not Detected	<input checked="" type="checkbox"/>

Other Markers			Reference Interval
Yeast	Not Detected	<input checked="" type="checkbox"/>	None – Rare
RBC	Not Detected	<input checked="" type="checkbox"/>	None – Rare
WBC	Not Detected	<input checked="" type="checkbox"/>	None – Rare
Muscle fibers	Rare	<input checked="" type="checkbox"/>	None – Rare
Vegetable fibers	Rare	<input checked="" type="checkbox"/>	None – Few
Charcot-Leyden Crystals	Not Detected	<input checked="" type="checkbox"/>	None
Pollen	Not Detected	<input checked="" type="checkbox"/>	None

Macroscopic Appearance	Result	
Mucus	Negative	<input checked="" type="checkbox"/>

This test is not designed to detect *Cyclospora cayetanensis* or *Microsporidia* spp.

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.

**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.

**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

**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".

SPECIMEN DATA	
<b>Comments:</b>	
<b>Date Collected:</b>	<b>Specimens Collected: 3</b>
<b>Date Received:</b>	
<b>Date Reported:</b>	
<b>Methodology:</b> Microscopy, Macroscopic Observation	

ORDER: 999999-9999  
PATIENT: Sample Patient  
ID: 999999  
SEX:  
AGE:  
DOB:

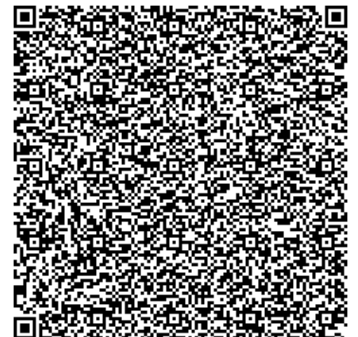
CLIENT #: 999999  
DOCTOR: Sample Doctor ND  
Doctors Data Inc  
123 Main St.  
St. Charles, IL 60174 USA



Parasitology; Microscopy

SPECIMEN DATA

Comments:



Date Collected:  
Date Received:  
Date Reported:  
Methodology:

Specimens Collected: 3

ORDER: 999999-9999  
 PATIENT: Sample Patient  
 ID: 999999  
 SEX:  
 AGE:  
 DOB:

CLIENT #: 999999  
 DOCTOR: Sample Doctor ND  
 Doctors Data Inc  
 123 Main St.  
 St. Charles, IL 60174 USA



Bacterial Susceptibilities

*Klebsiella pneumoniae*

NATURAL ANTIBACTERIALS

	LOW SENSITIVITY	HIGH SENSITIVITY
Black Walnut*		
Caprylic Acid*		
Uva Ursi*		
Olive Leaf Extract*		
Oregano*		
Goldenseal*		
Ionic Silver*		
Colloidal Silver*		

PRESCRIPTIVE AGENTS

	RESISTANT	INTERMEDIATE	SUSCEPTIBLE
Amoxicillin-Clavulanic Acid			✓
Ampicillin	✓		
Cefazolin			✓
Ceftazidime			✓
Ciprofloxacin			✓
Sulfamethoxazole / Trimethoprim			✓

**Natural antibacterial** agents may be useful for treatment of patients when organisms display in-vitro sensitivity to these agents. The test is performed by using standardized techniques and filter paper disks impregnated with the listed agent. Relative sensitivity is reported for each natural agent based upon the diameter of the zone of inhibition surrounding the disk. Data based on over 5000 individual observations were used to relate the zone size to the activity level of the agent. A scale of relative sensitivity is defined for the natural agents tested.

**Susceptible** results imply that an infection due to the bacteria may be appropriately treated when the recommended dosage of the tested antimicrobial agent is used. **Intermediate** results imply that response rates may be lower than for susceptible bacteria when the tested antimicrobial agent is used. **Resistant** results imply that the bacteria will not be inhibited by normal dosage levels of the tested antimicrobial agent.

SPECIMEN DATA

<b>Comments:</b>		
<b>Date Collected:</b>	<b>Specimens Collected:</b> 3	
<b>Date Received:</b>		
<b>Date Reported:</b>		
<b>Methodology:</b> Disk Diffusion		

\*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.

ORDER: 999999-9999  
 PATIENT: Sample Patient  
 ID: 999999  
 SEX:  
 AGE:  
 DOB:

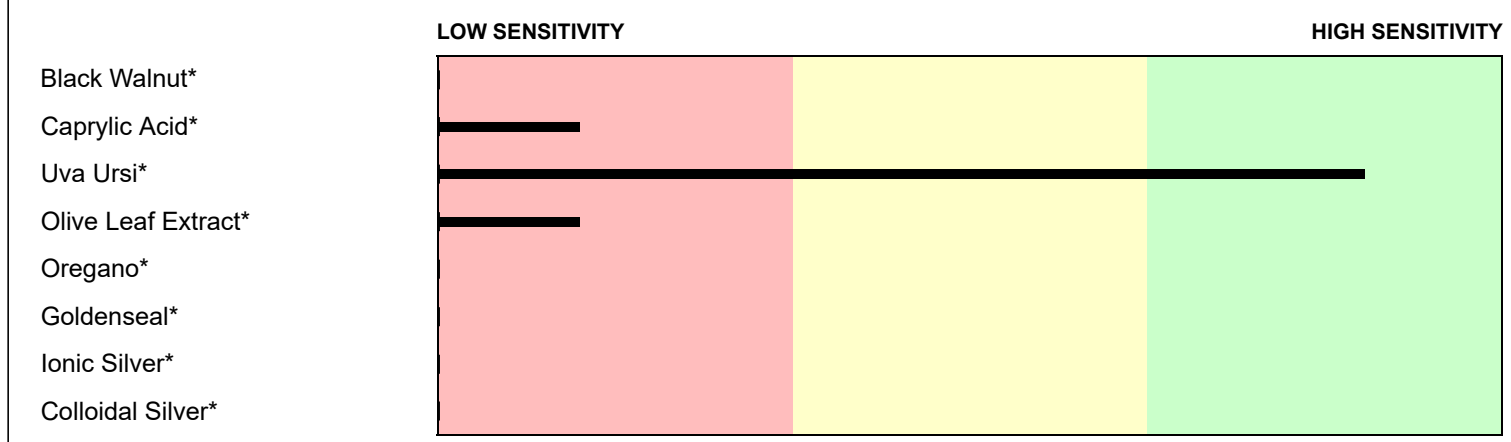
CLIENT #: 999999  
 DOCTOR: Sample Doctor ND  
 Doctors Data Inc  
 123 Main St.  
 St. Charles, IL 60174 USA



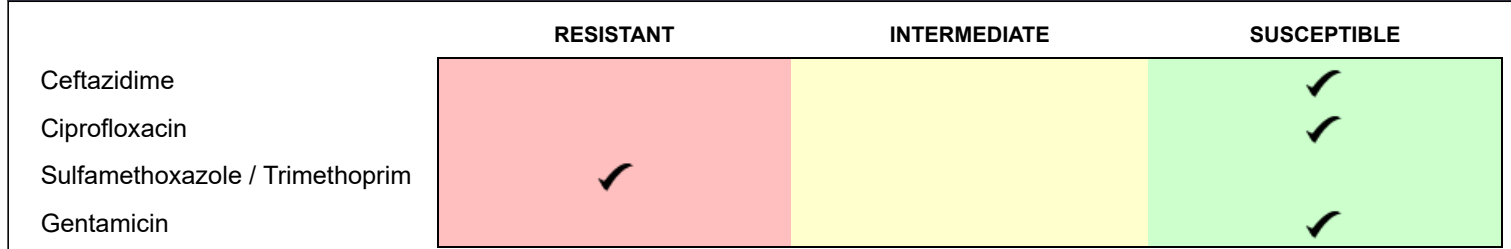
Bacterial Susceptibilities

*Pseudomonas aeruginosa*

NATURAL ANTIBACTERIALS



PRESCRIPTIVE AGENTS



**Natural antibacterial** agents may be useful for treatment of patients when organisms display in-vitro sensitivity to these agents. The test is performed by using standardized techniques and filter paper disks impregnated with the listed agent. Relative sensitivity is reported for each natural agent based upon the diameter of the zone of inhibition surrounding the disk. Data based on over 5000 individual observations were used to relate the zone size to the activity level of the agent. A scale of relative sensitivity is defined for the natural agents tested.

**Susceptible** results imply that an infection due to the bacteria may be appropriately treated when the recommended dosage of the tested antimicrobial agent is used. **Intermediate** results imply that response rates may be lower than for susceptible bacteria when the tested antimicrobial agent is used. **Resistant** results imply that the bacteria will not be inhibited by normal dosage levels of the tested antimicrobial agent.

SPECIMEN DATA


**Comments:**

**Date Collected:** \_\_\_\_\_ **Specimens Collected:** 3

**Date Received:** \_\_\_\_\_

**Date Reported:** \_\_\_\_\_

**Methodology:** Disk Diffusion



\*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.

## 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. *Clostridioides 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 boltea*, 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. Imbalanced bacteria are commonly more abundant in association with insufficiency dysbiosis, and/or a fecal pH more towards the alkaline end of the reference range (5.8 - 7.0). Treatment with antimicrobial agents is unnecessary unless bacteria appear under the dysbiotic category.

### Pathogenic/Dysbiotic Flora

In a healthy balanced state of intestinal flora, the beneficial bacteria make up a significant proportion of the total microflora. However, in many individuals there is an imbalance or deficiency of beneficial flora (insufficiency dysbiosis) and an overgrowth of non-beneficial (imbalance) or even pathogenic microorganisms. 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, allergies, autoimmune disease (e.g. rheumatoid arthritis), irritable bowel 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.



### Microbiology continued...

Bacterial sensitivities to a variety of prescriptive and natural agents have been provided for the pathogenic bacteria that were cultured from this patient's specimen. This provides the practitioner with useful information to help plan an appropriate treatment regimen. Supplementation with probiotics or consumption of foods (yogurt, kefir, miso, tempeh, tamari sauce) containing strains of lactobacilli, bifidobacteria, and enterococci may help restore healthy flora levels. Soluble fiber and polyphenols derived from chocolate, green tea, blackcurrant, red wine and grape seed extracts have been found to increase the numbers of beneficial bacteria. Hypochlorhydria may also predispose an individual to bacterial overgrowth, particularly in the small intestine. Nutritional anti-inflammatories can aid in reversing irritation to the GI lining. These include quercetin, vitamin C, curcumin, gamma-linoleic acid, omega-3 fatty acids (EPA, DHA), and aloe vera. Other nutrients such as zinc, beta-carotene, pantothenic acid, and L-glutamine provide support for regeneration of the GI mucosa. A comprehensive program may be helpful in individuals in whom a dysbiotic condition has caused extensive GI damage.

#### **Klebsiella spp**

*Klebsiella* spp. are gram-negative bacilli belonging to the *Enterobacteriaceae* family and closely related to the genera *Enterobacter* and *Serratia*. *Klebsiella* spp. are considered dysbiotic in the amount of 3 - 4+. *Klebsiella* spp. are widely distributed in nature and in the gastrointestinal tract of humans. In humans, they may colonize the skin, oral cavity, pharynx, or gastrointestinal tract. Regarded as normal flora in many parts of the colon, intestinal tract and biliary tract, the gut is the main reservoir of opportunistic strains. This bacteria has the potential to cause intestinal, lung, urinary tract, and wound infections, but overgrowth of *Klebsiella* spp. is commonly asymptomatic. *K. pneumoniae*, in particular, may cause diarrhea and some strains are enterotoxigenic. Infection has been linked to ankylosing spondylitis as well as myasthenia gravis (antigenic cross-reactivity), and these patients usually carry larger numbers of the organism in their intestines than healthy individuals. *Klebsiella oxytoca* causes antibiotic associated hemorrhagic colitis. These strains have been shown to produce a cytotoxin that is capable of inducing cell death in various epithelial-cell cultures.

*Klebsiella* is a significant nosocomial infectious agent, partially due to the ability of organisms to spread rapidly. *Klebsiella* accounts for approximately 3-7% of all hospital-acquired infections, placing it among the top eight pathogens in hospitals. Extraintestinal infection typically involves the respiratory or urinary tracts, but may infect other areas such as the biliary tract and surgical wound sites. *K. pneumoniae* and *K. oxytoca* are the two members of this genus responsible for most extraintestinal human infections.

Treatment of these organisms has become a major problem because of resistance to multiple antibiotics and potential transfer of plasmids to other organisms. Proper hand washing is crucial to prevent transmission from patient to patient via medical personnel. Contact isolation should be used for patients colonized or infected with highly antibiotic-resistant *Klebsiella* strains. *Klebsiella ozaenae* and *Klebsiella rhinoscleromatis* are infrequent isolates that are subspecies of *K. pneumoniae*; however, each is associated with a unique spectrum of disease. *K. ozaenae* is associated with atrophic rhinitis, a condition called ozena, and purulent infections of the nasal mucous membranes. *K. rhinoscleromatis* causes the granulomatous disease rhinoscleroma, an infection of the respiratory mucosa, oropharynx, nose, and paranasal sinuses.

Antibiotics may be indicated if symptoms are prolonged and in systemic infections. Refer to the antimicrobial susceptibilities for treatment.

#### **Pseudomonas aeruginosa**

*Pseudomonas aeruginosa* is a gram-negative aerobic bacillus belonging to the bacterial family *Pseudomonadaceae*. This opportunistic pathogen is considered dysbiotic in the amount of 3+ - 4+. *P. aeruginosa* is tolerant to a wide variety of physical conditions and temperatures. The exact source and mode of transmission is not known due to its ubiquitous presence in the environment. This bacterium has minimal nutritional requirements and is very resistant to disinfectants and most antibiotics. It survives in moist environments and can therefore grow in bottled non-carbonated mineral water, distilled water, tap water, and food. *Pseudomonas* can cause urinary tract infections, dermatitis, soft tissue infections, bacteremia, endocarditis, and osteochondritis. Skin and soft tissue infections can also proliferate in high moisture conditions (swimmer's ear, toe webs of athletes, skin of hot tub users).

Gastrointestinal colonization of immunocompromised patients with *P. aeruginosa* may lead to bacteremia. Gastrointestinal infections are found primarily in these immunosuppressed patients; however, a number of cases of diarrhea have been reported in otherwise healthy individuals. *Pseudomonas* is often asymptomatic in the gastrointestinal tract, but is considered a potential cause of antibiotic associated diarrhea.

For the otherwise healthy individual, antimicrobial therapy is often unnecessary. Antibiotics may be indicated if symptoms are prolonged and in systemic infections. Refer to the antimicrobial sensitivities to identify appropriate therapy.

### GI Pathogens

#### **Introduction**

The GI Pathogen profile is performed using an FDA-cleared multiplex PCR system. It should be noted that PCR testing is much more sensitive than traditional techniques and allows for the detection of extremely low numbers of pathogens. PCR testing does not differentiate between viable and non-viable pathogens and should not be repeated until 21 days after completion of treatment or resolution to prevent false positives due to lingering traces of DNA. PCR testing can detect multiple pathogens in the patient's stool but does not differentiate the causative pathogen. All decisions regarding the need for treatment should take the patient's complete clinical history and presentation into account.

## Parasitology

### Parasites

Parasites were detected by microscopic examination in this stool specimen. Intestinal parasites are abnormal inhabitants of the GI tract that live off and have the potential to cause damage to their host. Factors such as contaminated food and water supplies, day care centers, increased international travel, pets, carriers such as mosquitoes and fleas, and sexual transmission have contributed to an increased prevalence of intestinal parasites.

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 and 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, decreased immune function, and fatigue.

### *Entamoeba coli*

*Entamoeba coli*, an amoeba, was identified in this specimen. *E. coli* is generally considered nonpathogenic or commensal. It lives in the large intestine of humans, mainly at the level of the cecum and feeds on bacteria. Infection occurs via fecal-oral route, and indicates increased risk of exposure to potential pathogens.

Natural treatment agents include quassia, berberine, and hydrastis.