



\* US BioTek US BioTek. 16020 Linden Av N, Shoreline WA 98133

Lab ID  
Patient ID PAT-100009  
Ext ID 25283-0005

### Test Patient

Sex: Female • 45yrs • 01-Jan-80

RECEIVED  
10-Oct-25

## GI Basic

Specimen type - Stool

Collected

05-Oct-25

### MACROSCOPIC EXAMINATION

TEST	RESULT
Stool Colour	Brown
Stool Form	Semiformed
Mucous	PRESENT

### OCCULT BLOOD

TEST	INTERPRETATION
Occult Blood	Negative

### Parasites & Worms

Dientamoeba fragilis  
Ascaris species, Roundworm

### Bacteria & Viruses

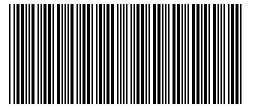
Methanobrevibacter smithii  
Desulfovibrio piger  
Pseudomonas aeruginosa  
Aeromonas species  
Klebsiella pneumoniae complex  
Fusobacterium species  
Helicobacter pylori  
Adenovirus 40/41

### Mycology

Candida parapsilosis  
Candida albicans

### MICROBIOTA RATIO

TEST	RESULT	H/L	REFERENCE	UNITS
Firmicutes/Bacteroidetes Ratio	1.91	H	(<1.00)	ratio



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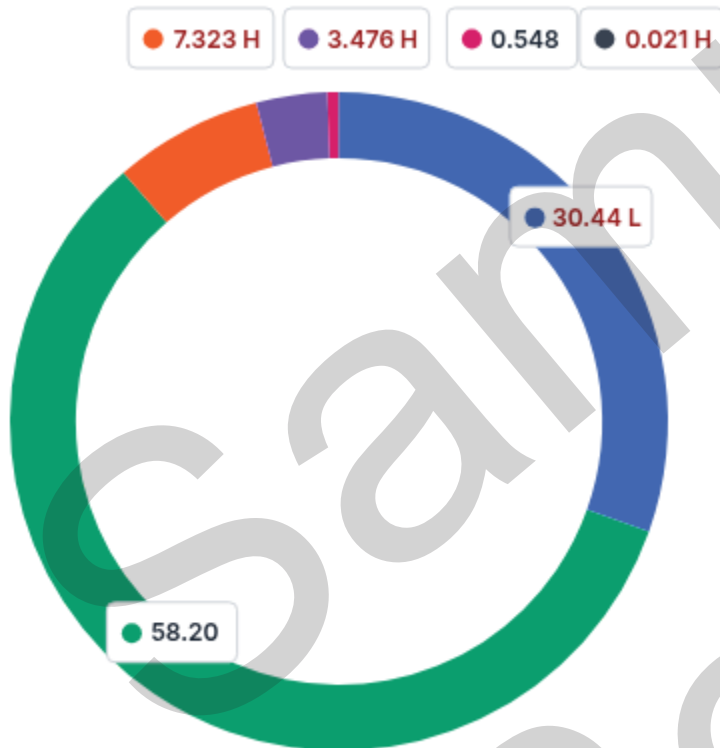
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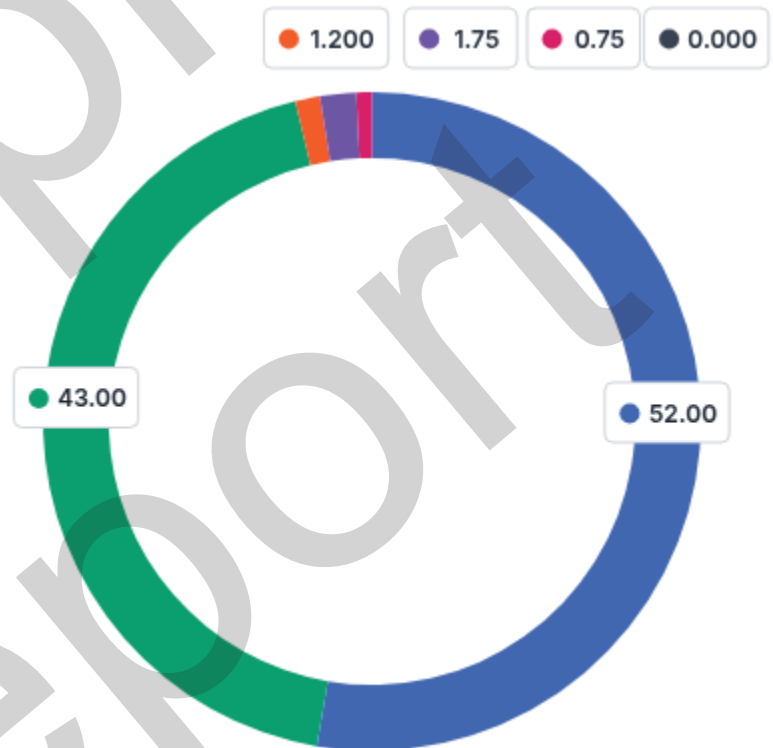
#### COMMENSAL RELATIVE ABUNDANCE

TEST	RESULT	H/L	REFERENCE	UNITS
Actinobacteria Phylum	0.548		(0.001-1.500)	%
Bacteroidetes Phylum	30.44	L	(40.00-87.00)	%
Euryarchaeota Phylum	0.021	H	(0.000-0.010)	%
Firmicutes Phylum	58.20		(10.00-60.00)	%
Proteobacteria Phylum	7.323	H	(0.500-5.000)	%
Verrucomicrobia Phylum	3.476	H	(0.000-2.400)	%

#### Your Phyla



#### Healthy Phyla





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#### PARASITES

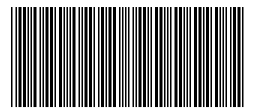
TEST	RESULT	H/L	REFERENCE	UNITS
Blastocystis hominis	<DL		(<1.00)	x10 <sup>5</sup> org/g
Cryptosporidium species	<DL		(<1.00)	x10 <sup>5</sup> org/g
Cyclospora cayetanensis	<DL		(<1.00)	x10 <sup>5</sup> org/g
Dientamoeba fragilis	1.77	H	(<1.00)	x10 <sup>5</sup> org/g
Entamoeba histolytica	<DL		(<1.00)	x10 <sup>5</sup> org/g
Giardia intestinalis	<DL		(<1.00)	x10 <sup>5</sup> org/g
Enterocytozoon species	<DL		(<1.00)	x10 <sup>5</sup> org/g

#### HELMINTHS

TEST	RESULT
Ancylostoma species Hookworm	Not Detected
Ascaris species, Roundworm	DETECTED
Enterobius vermicularis, Pinworm	Not Detected
Hymenolepis spp, Tapeworm	Not Detected
Necator americanus, Hookworm	Not Detected
Strongyloides spp, Roundworm	Not Detected
Taenia species, Tapeworm	Not Detected
Trichuris trichiura, Whipworm	Not Detected

#### VIRUSES

TEST	RESULT
Adenovirus 40/41	DETECTED
Astrovirus (hAstro)	Not Detected
Norovirus GI/II	Not Detected
Rotavirus A	Not Detected
Sapovirus (I,II,IV,V)	Not Detected



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#### BACTERIAL PATHOGENS

TEST	RESULT	H/L	REFERENCE	UNITS
Aeromonas species	1.83	H	(<1.00)	x10 <sup>3</sup> CFU/g
Campylobacter species	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
C. difficile, Toxin A	<DL		(<1.00)	x10 <sup>4</sup> CFU/g
C. difficile, Toxin B	<DL		(<1.00)	x10 <sup>4</sup> CFU/g
Clostridium difficile, Hypervirulent	<DL		(<1.00)	x10 <sup>3</sup> CFU/g
Enterogaagregative E. coli	<DL		(<1.00)	x10 <sup>3</sup> CFU/g
Enteropathogenic E. coli	<DL		(<1.00)	x10 <sup>3</sup> CFU/g
E. coli O157	<DL		(<1.00)	x10 <sup>2</sup> CFU/g
Enteroinvasive E. coli/Shigella	<DL		(<1.00)	x10 <sup>3</sup> CFU/g
Enterotoxigenic E. coli LT/ST	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
Salmonella species	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
Shiga toxigenic E. coli (stx1/2)	<DL		(<1.00)	x10 <sup>3</sup> CFU/g
Vibrio species	<DL		(<1.00)	x10 <sup>4</sup> CFU/g
Yersinia species	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
Helicobacter pylori	2.09	H	(<1.00)	x10 <sup>3</sup> CFU/g

#### HELICOBACTER PROFILE

TEST	RESULT
H. pylori Antigen	<b>POSITIVE</b>

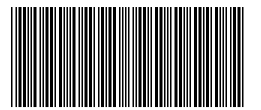
#### H. pylori Virulence Factors

TEST	RESULT
Virulence Factor, babA	<b>DETECTED</b>
Virulence Factor, cagA	<b>Not Detected</b>
Virulence Factor, oipA	<b>Not Detected</b>
Virulence Factor, vacA	<b>Not Detected</b>
Virulence Factor, virB	<b>Not Detected</b>
Virulence Factor, virD	<b>Not Detected</b>
Virulence Factor, dupA	<b>Not Detected</b>
Virulence Factor, iceA	<b>Not Detected</b>

#### H. pylori Resistance Genes

TEST	RESULT
Resistance gene A2142C	<b>DETECTED</b>
Resistance gene A2142G	<b>Not Detected</b>
Resistance gene A2143G	<b>Not Detected</b>

● Actinobacteria Phylum ● Bacteroidetes Phylum ● Euryarchaeota Phylum ● Firmicutes Phylum ● Proteobacteria Phylum ● Verrucomicrobia Phylum



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#### OPPORTUNISTIC BACTERIA

TEST	RESULT	H/L	REFERENCE	UNITS
Bacillus species	<DL		(<1.00)	x10 <sup>4</sup> CFU/g
Bacteroides fragilis	<DL		(<250.00)	x10 <sup>5</sup> CFU/g
Phocaeicola vulgatus	<DL		(<300.00)	x10 <sup>5</sup> CFU/g
Bacteroides thetaiotaomicron	<DL		(<300.00)	x10 <sup>5</sup> CFU/g
Enterobacter cloacae complex	<DL		(<5.00)	x10 <sup>5</sup> CFU/g
Enterococcus faecalis	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
Enterococcus faecium	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
Morganella species	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
Pseudomonas species	<DL		(<1.00)	x10 <sup>4</sup> CFU/g
Pseudomonas aeruginosa	11.36	H	(<3.00)	x10 <sup>4</sup> CFU/g
Staphylococcus species	<DL		(<1.00)	x10 <sup>3</sup> CFU/g
Staphylococcus aureus	<DL		(<5.00)	x10 <sup>3</sup> CFU/g
Streptococcus agalactiae	<DL		(<3.00)	x10 <sup>4</sup> CFU/g
Streptococcus anginosus	<DL		(<1.00)	x10 <sup>6</sup> CFU/g
Streptococcus mutans	<DL		(<1.00)	x10 <sup>4</sup> CFU/g
Streptococcus oralis	<DL		(<1.00)	x10 <sup>6</sup> CFU/g
Streptococcus salivarius	<DL		(<5.00)	x10 <sup>6</sup> CFU/g

#### HYDROGEN UTILISING MICROBES

TEST	RESULT	H/L	REFERENCE	UNITS
Desulfovibrio piger	396.00	H	(<18.00)	x10 <sup>6</sup> CFU/g
Methanobrevibacter smithii	5.54	H	(<1.00)	x10 <sup>5</sup> CFU/g

#### POTENTIAL AUTOIMMUNE TRIGGERS

TEST	RESULT	H/L	REFERENCE	UNITS
Citrobacter species	<DL		(<5.00)	x10 <sup>4</sup> CFU/g
Citrobacter freundii complex	0.55		(<5.00)	x10 <sup>4</sup> CFU/g
Klebsiella species	1.37		(<5.00)	x10 <sup>3</sup> CFU/g
Klebsiella pneumoniae complex	11.00	H	(<5.00)	x10 <sup>5</sup> CFU/g
Prevotella copri	<DL		(<1.00)	x10 <sup>9</sup> CFU/g
Proteus species	<DL		(<5.00)	x10 <sup>5</sup> CFU/g
Proteus mirabilis	<DL		(<5.00)	x10 <sup>4</sup> CFU/g
Fusobacterium species	42.42	H	(<20.00)	x10 <sup>4</sup> CFU/g

Actinobacteria Phylum Bacteroidetes Phylum Euryarchaeota Phylum Firmicutes Phylum Proteobacteria Phylum Verrucomicrobia Phylum



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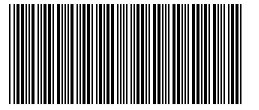
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#### MYCOLOGY

TEST	RESULT	H/L	REFERENCE	UNITS
● <b>Candida albicans</b>	<b>6.03</b>	<b>H</b>	(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida dubliniensis</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida famata</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida glabrata</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida guilliermondii</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida intermedia</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida kefyr</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida krusei</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida lambica</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida lipolytica</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida lusitanae</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida parapsilosis</b>	<b>2.20</b>	<b>H</b>	(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida tropicalis</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Candida species</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Geotrichum species</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Rhodotorula species</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g
● <b>Saccharomyces cerevisiae</b>	<DL		(<1.00)	x10 <sup>5</sup> CFU/g

Sample Report



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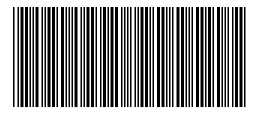
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#### NORMAL BACTERIAL GUT FLORA

TEST	RESULT	H/L		REFERENCE	UNITS
Akkermansia muciniphila	118.00	H		(1.00-50.00)	x10 <sup>7</sup> CFU/g
TOTAL BIFIDOBACTERIA	10.00			(<2000.00)	x10 <sup>6</sup> CFU/g
Bifidobacterium adolescentis	2.00			(<1000.00)	x10 <sup>6</sup> CFU/g
Bifidobacterium bifidum	<DL			(<1000.00)	x10 <sup>6</sup> CFU/g
Bifidobacterium breve	5.00			(<1000.00)	x10 <sup>6</sup> CFU/g
Bifidobacterium longum	3.00			(<1000.00)	x10 <sup>6</sup> CFU/g
Clostridium species	114.70	H		(5.00-50.00)	x10 <sup>7</sup> CFU/g
Enterococcus species	56.50			(1.90-2000.00)	x10 <sup>3</sup> CFU/g
Escherichia species	5385.00	H		(3.70-3800.00)	x10 <sup>4</sup> CFU/g
Faecalibacterium prausnitzii	890.00			(100.00-3500.00)	x10 <sup>6</sup> CFU/g
TOTAL LACTOBACILLI	4.80			(<3000.00)	x10 <sup>3</sup> CFU/g
Lactobacillus acidophilus	3.00			(<500.00)	x10 <sup>3</sup> CFU/g
Lactobacillus casei	<DL			(<500.00)	x10 <sup>3</sup> CFU/g
Lactobacillus delbrueckii	<DL			(<500.00)	x10 <sup>3</sup> CFU/g
Lactobacillus plantarum	<DL			(<500.00)	x10 <sup>3</sup> CFU/g
Lactobacillus rhamnosus	1.80			(<500.00)	x10 <sup>3</sup> CFU/g
Lactobacillus salivarius	<DL			(<500.00)	x10 <sup>3</sup> CFU/g
Oxalobacter formigenes	5.69			(<50.00)	x10 <sup>6</sup> CFU/g

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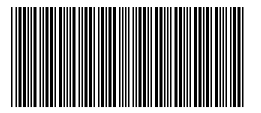
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# The Four “R” Treatment Protocol

REMOVE	Using a course of antimicrobial, antibacterial, antiviral or anti parasitic therapies in cases where organisms are present. It may also be necessary to remove offending foods, gluten, or medication that may be acting as antagonists.  Consider testing IgG96 foods as a tool for removing offending foods.	ANTIMICROBIAL	Oil of oregano, berberine, caprylic acid
		ANTIBACTERIAL	Liquorice, zinc carnosine, mastic gum, tribulus, berberine, black walnut, caprylic acid, oil of oregano
		ANTIFUNGAL	Oil of oregano, caprylic acid, berberine, black walnut
		ANTIPARASITIC	Artemesia, black walnut, berberine, oil of oregano
		ANTIVIRAL	Cat's claw, berberine, echinacea, vitamin C, vitamin D3, zinc, reishi mushrooms
		BIOFILM	Oil of oregano, protease
REPLACE	In cases of maldigestion or malabsorption, it may be necessary to restore proper digestion by supplementing with digestive enzymes.	DIGESTIVE SUPPORT	Betaine hydrochloride, tilactase, amylase, lipase, protease, apple cider vinegar, herbal bitters
REINOCULATE	Recolonisation with healthy, beneficial bacteria. Supplementation with probiotics, along with the use of prebiotics helps re-establish the proper microbial balance.	PREBIOTICS	Slippery elm, pectin, larch arabinogalactans
		PROBIOTICS	Bifidobacterium animalis sup lactose, lactobacillus acidophilus, lactobacillus plantarum, lactobacillus casei, bifidobacterium breve, bifidobacterium bifidum, bifidobacterium longum, lactobacillus salivarius sup salivarius, lactobacillus paracasei, lactobacillus rhamnosus, Saccaromyces boulardii
REPAIR & REBALANCE	Restore the integrity of the gut mucosa by giving support to healthy mucosal cells, as well as immune support. Address whole body health and lifestyle factors so as to prevent future GI dysfunction.	INTESTINAL MUCOSA IMMUNE SUPPORT	Saccaromyces boulardii, lauric acid
		INTESTINAL BARRIER REPAIR	L-Glutamine, aloe vera, liquorice, marshmallow root, okra, quercetin, slippery elm, zinc carnosine, Saccaromyces boulardii, omega 3 essential fatty acids, B vitamins
		SUPPORT CONSIDERATION	Sleep, diet, exercise, and stress management



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### Phyla Microbiota Comment

#### EURYARCHAEOTA (PHYLUM) ELEVATED:

DESCRIPTION: Euryarchaeota are a phylum of a diverse range of bacteria, including methanogens, halophiles and sulfate-reducers. Three distinct species within the group of Euryarchaeota have been regularly detected within the human body. Among these is the primary colonizer of the human gut system *Methanobrevibacter smithii* and the less frequently found species *Methanosphaera stadtmanae*, while in the oral cavity *M. oralis* is the predominating methanogenic species. Methanogens support the growth of fermenting bacteria, which themselves could be either true pathogens or at least opportunistic pathogens but also members of the commensal flora. They may also transform heavy metals or metalloids into volatile methylated derivatives which are known to be more toxic than the original compounds. Elevated Euryarchaeota may be associated with inflammatory bowel disease, Crohn's, irritable bowel syndrome, colorectal cancer, diverticulosis, and obesity. It may also affect short chain fatty acid production and absorption.

TREATMENT SUGGESTIONS: If treatment is warranted, Statins may be used to inhibit methanogenic archaea growth without affecting bacterial numbers. Symptoms may also be treated with dietary modification (low FODMAP) and probiotics. A lactulose SIBO test may be considered to assess Methanogen levels.

#### VERRUCOMICROBIA (PHYLUM) ELEVATED:

DESCRIPTION: Verrucomicrobia is a phylum of Gram-negative bacteria that contains only a few described species, found in the environment and gastrointestinal tract. *Akkermansia* spp. is involved in gut membrane integrity and may be increased with polyphenols and prebiotics. Verrucomicrobia aid in glucose homeostasis of the human gut and have anti-inflammatory properties that further aid in intestinal health.

TREATMENT SUGGESTIONS: Probiotic use and dietary modification use may assist in the rebalancing of microbial flora.

#### FIRMICUTES/BACTEROIDETES RATIO ELEVATED:

Elevated Firmicutes/Bacteroidetes ratio is frequently cited in the scientific literature as a hallmark of obesity, metabolic syndrome, irritable bowel syndrome or diabetes risk. The ratio may also be used to evaluate commensal microbial balance. The calculation provided in this report is made by the sum of abundance of Firmicutes tested divided by the sum of abundance Bacteroidetes. Reference ranges are based off internal cohort studies.

TREATMENT SUGGESTIONS: Balance commensal bacteria using the 4R Protocol which is located at the end of this test report. When firmicutes are high, consider using *Bifidobacterium* probiotics and *Saccharomyces boulardii* primarily. *Lactobacillus* spp. and *Bacillus* spp. (found in probiotics) can elevate firmicutes. It is further suggested to optimize the patient diet. A lower fat diet may assist to normalize the F/B ratio.

### Parasites/Helminths Comment

#### ELEVATED DIENTAMOEBIA FRAGILIS LEVEL:

*Dientamoeba fragilis* appears to be extremely common and may have a cosmopolitan distribution, although there are large variations in prevalence. *Dientamoeba fragilis* has been linked to intestinal symptoms, especially in children. The most common symptoms associated with this organism are abdominal pain, intermittent diarrhoea, bloating and anorexia.

TREATMENT SUGGESTIONS: Mild symptoms are self-limiting. If treatment is warranted, metronidazole for 10 days or a single 2g dose of Tinidazole may be used. Tetracycline has also proven effective in adults. Rule out allergy to above medication before prescribing/taking. Consult ID specialist if patient is showing severe symptoms or immunocompromised.

#### ASCARIS SPECIES (Roundworm) DETECTED:

*Ascaris* species (including *A. lumbricoides* and *A. suum*) are the most common parasitic roundworm in humans. Hosts may be asymptomatic, causing only malnutrition and growth retardation or present with severe gastrointestinal (abdominal pain, nausea, vomiting, bloating or diarrhoea) or lung symptoms (fever, cough or wheezing). Adult worms can also migrate causing cholecystitis, cholangitis, pancreatitis, small bowel obstruction or appendicitis. Infection occurs via ingestion of eggs, usually found in stool-contaminated soil.

TREATMENT SUGGESTIONS:



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Effective treatments include Albendazole or Mebendazole single oral dose. Rule out allergy to above medication before prescribing/taking. Can repeat dose after 4-6 weeks. Whole family to be treated simultaneously. Hand hygiene and washing bedding /clothes in hot water cycle is recommended to prevent recurrence. A repeat test should be suggested post therapy.

### Viral Pathogens Comment

ADENOVIRUS 40/41 DETECTED:

DESCRIPTION: Adenovirus 40/41 is also known as Enteric adenovirus and transmission is via the faecal-oral route. Common cause of watery diarrhoea/gastroenteritis in infants and children but can also affect adults. Adenovirus is usually self-limiting by 1 week. A repeat test for Enteric Viral Pathogens should be requested to ensure that the virus has cleared.

TREATMENT SUGGESTIONS:

Conservative hygiene measures such as handwashing, Hydration and strict isolation is recommended for cases as such.

### Bacterial Pathogens Comment

AEROMONAS SPECIES ELEVATED: PHYLUM: Proteobacterium

DESCRIPTION: Aeromonas is a gram-negative rod and there are at least four species, with A. hydrophilia being the most common. Aeromonas are ubiquitous in freshwater environments. The number present is dependent on the extent of sewage pollution and the temperature. Recent studies have directly attributed Aeromonas as the cause of food-borne infections. The following foods may harbor the organism: raw meat, freshwater fish, shellfish and other seafood. Raw milk can also be a source of infection. Aeromonas gastroenteritis may affect both children and adults with the highest seasonal incidence occurring in the summer months. Symptoms tend to be generally mild, self-limiting diseases with watery diarrhea. Bloody stools have been reported. Aeromonas infections tend to be more acute in children and more chronic in adults.

TREATMENT SUGGESTIONS: Mild enterocolitis can be self-limiting. Trimethoprim/Sulphamethoxazole (Bactrim DS/Septrin DS): 160+800 mg orally, 12-hourly for 5 days. (Child: 4+20 mg/kg) Or Ciprofloxacin (adults) 500mg orally, 12 hourly for 5 days A reactive arthritis may follow infection from this organism. Rule out allergy to above medication before prescribing/taking. Consult ID specialist if patient is showing severe symptoms or immunocompromised.

HELICOBACTER PYLORI ELEVATED: PHYLUM: Proteobacteria

DESCRIPTION: Helicobacter pylori is a gram-negative bacterium found on the luminal surface of the gastric epithelium. An elevated result indicates a current infection and is not affected by the presence of other organisms, antacids, barium sulphate, blood or fat. Please correlate infection clinically with signs and symptoms.

TREATMENT: Triple therapy: PPI, clarithromycin and amoxicillin or metronidazole, 7-14 days. If penicillin allergic: PPI, clarithromycin and clindamycin or metronidazole, 7-14 days. If the patient is asymptomatic consider other alternative therapies including:

- o Black currant seed oil and fish oil
- o Lactobacillus Probiotics
- o Vitamin C
- o Mastic gum.

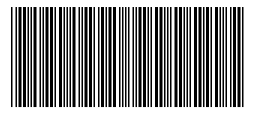
H. Pylori Virulence Factor, babA DETECTED:

Blood Group Antigen Binding Adhesion (BabA) promotes DNA breakage in host cell, Improves H. pylori adherence ("stickiness") to epithelial cells and can promote other virulence factors, especially CagA.

Treatment: More aggressive treatment may be warranted; consider the use of adhesion inhibitions.

### Opportunistic Bacteria Comment

PSEUDOMONAS AERUGINOSA ELEVATED: PHYLUM: Proteobacteria



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**DESCRIPTION:** *Pseudomonas aeruginosa* is a gram-negative, aerobic, non-spore forming bacteria that can cause a variety of infections in both immunocompetent and immunocompromised hosts. It is commonly found in the environment, particularly in freshwater, hot tubs, and swimming pools. Chronic gastrointestinal colonization is acknowledged to be an important component of *P. aeruginosa* diarrheal disease and systemic infections. Since disruption of the normal flora by antibiotics can reduce colonization resistance and promote pathologic colonization with *P. aeruginosa*, enterocolitis due to *P. aeruginosa* may also be considered to be an antibiotic-associated gastroenteritis. *Pseudomonas aeruginosa* in the gastrointestinal tract can cause inflammation, epithelial barrier dysfunction, tight cell junction interruption, and intestinal permeability.

**TREATMENT SUGGESTIONS:** If treatment is warranted, *Pseudomonas* is usually susceptible to antipseudomonal penicillins, aminoglycosides, carbapenems, 3rd generation cephalosporins and gentamycin. Plant-derived anti-biofilm products identified against *P. aeruginosa* include alkaloids, organosulfur compounds, flavonoids, phenolic compounds and terpenoids. Rule out allergy to above medication before prescribing/taking.

**METHANOBREVIBACTER SMITHII ELEVATED:** PHYLUM: Euryarchaeota

**DESCRIPTION:** *Methanobrevibacter smithii* is a methane-producing microbe that plays an important role in the gut ecosystem by facilitating carbohydrate fermentation and production of short-chain fatty acids by commensal bacteria. Elevated levels may be associated with abdominal bloating, constipation, flatulence, inflammatory bowel disease (IBD), irritable bowel syndrome (IBS), colorectal cancer, diverticulosis or obesity and often correlate with a positive SIBO test. *Methanobrevibacter smithii* has also been closely correlated with the presence of *Blastocystis hominis*.

**TREATMENT SUGGESTIONS:** Elimination of methanogenic flora using antibiotic treatment may contribute to therapeutic benefits and include neomycin or rifaximin. Antimicrobial herbs may also be beneficial in treatment (including garlic and oregano). Rule out allergy to above medication before prescribing/taking.

**DESULFOVIBRIO PIGER ELEVATED:** PHYLUM: Proteobacterium

**DESCRIPTION:** *Desulfovibrio piger* is part of a group called sulfate-reducing bacteria (SRB) and are normal inhabitants of the intestine. Sulfate is present in different concentrations in the intestine dependent on diet. Remnants not absorbed, alongside the presence of lactate, promote the growth of SRB. *Desulfovibrio Piger* has been implicated in gastrointestinal disorders such as ulcerative colitis via the reduction of sulfate to hydrogen sulfide in the gut. High *Desulfovibrio piger* levels may be associated with diarrhea or inflammatory bowel disease.

**TREATMENT SUGGESTIONS:** Treatment options include lowering the intake of sulfate rich foods such as some breads, dried fruits, beers, ciders and wines. It is also suggested to avoid foods high in fat.

### Potential Autoimmune Comment

**FUSOBACTERIUM SPECIES ELEVATED:** PHYLUM: Fusobacteriota

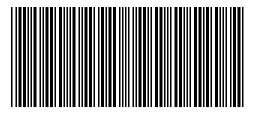
**DESCRIPTION:** *Fusobacterium* species are gram-negative bacteria and are common members of the human oral and faecal microbiome. It has been demonstrated to promote the release of intestinal inflammatory factors and disrupt the intestinal barrier function. As such *F. nucleatum* elevation may contribute to the etiology of some gastrointestinal disorders, such as appendicitis, colon cancer, and inflammatory bowel disease (IBD). It may also induce an increase in secretory IgA and a decrease in beneficial bacteria levels such as *Lactobacillus*. Review this level with faecal calprotectin.

**TREATMENT SUGGESTIONS:** If treatment is warranted, effective antibiotics may include metronidazole or erythromycin. The use of herbal antimicrobials (Tea polyphenols- green and black tea extracts and peppermint) and probiotic treatment may also be effective. Rule out allergy to above medication before prescribing/taking.

**KLEBSIELLA PNEUMONIAE COMPLEX ELEVATED:** PHYLUM: Proteobacteria

**DESCRIPTION:**

*Klebsiella pneumoniae* is a gram-negative, encapsulated, non-motile bacterium found in the environment and typically colonizes human mucosal surfaces of the oropharynx and gastrointestinal tract. Increased colonisation causes insult to the intestinal mucosa via the secretion of toxins and subsequent inflammatory response that may lead to inflammation-related gastrointestinal diseases. It is typically



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associated with diseases related to upper respiratory tract infection; however, elevated levels may be associated with gastrointestinal diseases such as Irritable bowel disease, Crohn's and ulcerative colitis.

### TREATMENT SUGGESTIONS:

Treating *K. pneumoniae* infections is difficult due to the increased emergence in resistant strains and if treatment is warranted, a combination of antibiotics may be used. *Klebsiella* appears to thrive in individuals on a high starch diet. Avoiding carbohydrates such as rice, potatoes, flour products and sugary foods may reduce the amount of *Klebsiella* in the gut. The use of herbal antimicrobials oregano (*Origanum vulgare*), sage (*Salvia officinalis*) or thyme (*Thymus vulgaris*) may also be effective.

## Mycology Comment

CANDIDA ALBICANS ELEVATED: PHYLUM: Ascomycota

DESCRIPTION: *Candida albicans* is a genus of yeasts found in the environment and present in healthy persons colonizing the oropharyngeal, oesophageal, and gastrointestinal mucosa. Considered an opportunistic pathogen, *C. albicans* can cause superficial but also more severe systemic infections. Candidiasis is an opportunistic infection due to *Candida*, which can affect the oral cavity, vagina, penis, or gastrointestinal tract. Elevated *Candida* gastrointestinal colonization is associated with several diseases including Crohn's and inflammatory bowel disease as well as with antibiotic usage. Other common symptoms include: Gas, bloating, constipation, nausea and skin conditions such as Eczema.

TREATMENT SUGGESTIONS: Dietary: Reduce intake of sugars, starches, and fungi. *Candida* infections may be treated if warranted with antifungal medications such as nystatin, clotrimazole, amphotericin B or miconazole. Probiotic *Lactobacillus* treatment may also be effective. Rule out allergy to above medication before prescribing/taking.

CANDIDA PARAPSILOSIS ELEVATED: PHYLUM: Ascomycota

*Candida parapsilosis* is a yeast species that is part of the normal human microbiota but can become opportunistic under certain conditions. Overgrowth of *C. parapsilosis* in the gut can disrupt the microbial balance and lead to symptoms such as bloating, gas, and diarrhea. In immunocompromised individuals, *C. parapsilosis* is a potential pathogen and has been linked to invasive infections, though gastrointestinal symptoms are more common in cases of mild dysbiosis. When elevated guided susceptibility testing should be considered.

## Normal Bacterial Flora Comment

BACTEROIDES FRAGILIS LOW: PHYLUM: Bacteroidetes

DESCRIPTION: *Bacteroides fragilis* is an anaerobic, Gram-negative bacterium. It is part of the normal microbiota of the human colon and is generally commensal. *Bacteroides fragilis* plays an intricate role in the human colon and usually has a beneficial relationship with the host. Low *Bacteroides fragilis* levels have been associated with inflammatory bowel disease and Crohn's.

TREATMENT SUGGESTIONS: Treatment may involve the use of probiotics and dietary modification.

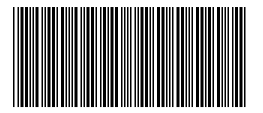
BIFIDOBACTERIUM ADOLESCENTIS LOW: PHYLUM: Actinobacteria

DESCRIPTION: *Bifidobacterium adolescentis* is an anaerobic species of bacteria found in the gastrointestinal tracts of humans. It is one of the most abundant and prevalent *Bifidobacterium* species commonly found in adults. It contributes to the production of GABA, a neurotransmitter that plays a role in reducing stress and anxiety. Some strains can synthesise B vitamins, such as folic acid. *B. adolescentis* enhances the growth of all bifidobacteria.

TREATMENT SUGGESTIONS: Consider a probiotic supplement containing *B. adolescentis* and consuming prebiotic-rich foods like garlic, onions, and whole grains. Increase dietary fibre from fruits, vegetables, and legumes, and incorporate fermented foods such as yogurt and kefir.

BIFIDOBACTERIUM BIFIDUM LOW: PHYLUM: Actinobacteria

DESCRIPTION: *Bifidobacterium bifidum* is a Gram-positive, anaerobic bacterium integral to the human gut microbiota, especially in infants. It ferments a variety of carbohydrates, including human milk oligosaccharides, aiding in digestion, and promoting a healthy gut flora. *B. bifidum* produces short-chain fatty acids that lower gut pH and inhibit pathogenic bacteria while supporting intestinal cells. It also



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modulates the immune system, enhancing immune responses and reducing inflammation, and strengthens the intestinal barrier. Clinically, *B. bifidum* has shown promise in alleviating gastrointestinal disorders.

### BIFIDOBACTERIUM LONGUM LOW: PHYLUM: Actinobacteria

**DESCRIPTION:** *Bifidobacterium longum* is a Gram-positive, catalase-negative, rod-shaped bacterium present in the human gastrointestinal tract and one of the *Bifidobacterium* species. It can induce and regulate immune responses, reduce the expression of inflammatory cytokines, and maintain the normal intestinal barrier function. *Bifidobacterium longum* is a clinically effective, well-established, multifunctional probiotic that has a long history of human use in alleviating gastrointestinal, immunological, and infectious diseases such as constipation, antibiotic associated diarrhoea, irritable bowel syndrome and ulcerative colitis. Low levels may be associated with irritable bowel syndrome, asthma, autism, depressive disorder and with pathogenic bacteria infection.

**TREATMENT SUGGESTIONS:** Treatment may involve the use of *Bifidobacterium longum* containing probiotics and treatment of any intestinal infections.

### ESCHERICHIA SPECIES ELEVATED: PHYLUM: Proteobacteria

**DESCRIPTION:** *Escherichia* is a genus of Gram-negative, non-spore-forming, facultatively anaerobic, rod-shaped bacteria and normal inhabitants of the gastrointestinal tract. Species include *E. albertii*, *E. fergusonii*, *E. hermannii*, *E. marmotae* and most notably *E. coli*. High levels may be indicative of increased intestinal inflammatory activity and be associated with irritable bowel syndrome, Crohn's, ulcerative colitis and diarrhea. Studies have also revealed that chronic psychological stress may be associated with an increase in *E.Coli* colonisation.

**TREATMENT SUGGESTIONS:** Commensal probiotic cocktails are suggested to prevent and reverse gut elevated colonization.

### LACTOBACILLUS CASEI LOW: PHYLUM: Firmicutes

**DESCRIPTION:** *Lactobacillus casei* is a Gram-positive, rod-shaped, non-spore-forming, anaerobic probiotic bacterium involved in the fermentation of foods like cheese and yogurt. It produces antimicrobial substances, enhances gut barrier function, reduces pathogenic bacteria, and modulates the immune system. This bacterium is used to prevent and may assist various forms of diarrhea, including infectious diarrhea, traveller's diarrhea, and antibiotic-associated diarrhea.

**TREATMENT SUGGESTIONS:** Consider probiotic supplementation containing *L. casei* and consuming fermented foods such as cheese and yogurt.

### LACTOBACILLUS DELBRUECKII LOW: PHYLUM: Firmicutes

#### DESCRIPTION:

*Lactobacillus delbrueckii* is a beneficial Gram-positive bacterium commonly found in the gut microbiome and known for its role in maintaining gastrointestinal health. It produces lactic acid through the fermentation of carbohydrates, contributing to a lower gut pH, which inhibits the growth of pathogenic microorganisms such as *Clostridium* and *Candida* species. Additionally, *L. delbrueckii* can enhance the intestinal barrier function and modulate the host immune response by promoting the production of anti-inflammatory cytokines. Its presence in the gut is associated with improved digestion and nutrient absorption, making it an important component in supporting overall gut health and microbial balance.

### LACTOBACILLUS PLANTARUM LOW: PHYLUM: Firmicutes

**DESCRIPTION:** *Lactobacillus plantarum* is a Gram-positive, non-spore-forming, rod-shaped bacterium. *L. plantarum* plays a crucial role in gut health by enhancing intestinal barrier function, modulating the immune system, and inhibiting pathogenic bacteria. Additionally, it is beneficial for conditions such as irritable bowel syndrome, ulcerative colitis, and high cholesterol.

**TREATMENT SUGGESTIONS:** Consider probiotic supplementation containing *L. plantarum*.

### LACTOBACILLUS SALIVARIUS LOW: PHYLUM: Firmicutes

**DESCRIPTION:** *Lactobacillus salivarius* is a Gram-positive, rod-shaped, non-spore-forming bacterium predominantly found in the human oral cavity, gastrointestinal tract, and vagina. It plays a significant role in maintaining oral and gut health by producing lactic acid and



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bacteriocins, which inhibit the growth of pathogenic bacteria. *L. salivarius* enhances gut barrier function, modulates the immune system, and helps in the digestion of proteins and complex carbohydrates. It has been studied for its potential benefits in managing conditions such as irritable bowel syndrome (IBS), periodontal disease, and atopic dermatitis, highlighting its importance in promoting overall health and preventing infections.

TREATMENT SUGGESTIONS: Consider *L. salivarius* as a probiotic strain which may improve intestinal permeability and immune response.

CLOSTRIDIUM SPECIES ELEVATED: PHYLUM: Firmicutes

DESCRIPTION: Clostridium is a genus of anaerobic, Gram-positive bacteria found in the environment and the intestinal tract. This genus includes several species and can utilize large amounts of nutrients that cannot be digested by host and produce short-chain fatty acids (SCFAs), which play a noticeable role in intestinal homeostasis. Colonisation of Clostridium species may be affected by diet (carbohydrate and protein in diet) and general health and may be protective against inflammation and infection. However, some species may act as potential pathogens. Elevated Clostridium species may indirectly damage the intestinal epithelial cells. Another symptom may include constipation.

TREATMENT SUGGESTIONS: Treatment may involve the use of probiotics, treatment of any intestinal infections and dietary modification (reduce consumption of different fibres, such as inulin, oligofructose, arabinoxylan, guar gum and starch).

AKKERMANSIA MUCINIPHILA ELEVATED: PHYLUM: Verrucomicrobia

DESCRIPTION: Akkermansia muciniphila is a Gram-negative, strictly anaerobic, non-motile bacterium, often considered a human intestinal symbiont. There is growing evidence to suggest that the prevalence of this bacteria is associated with intestinal homeostasis, immunity, and a healthy gut. However, elevated colonisation may be associated with intestinal inflammation.

TREATMENT SUGGESTIONS: Treatment may involve the use of probiotics, treatment of any intestinal infections and dietary modification.

## Methodology

Automated Chemistry/Immunochemistry, Quantitative PCR (qPCR), Polymerase Chain Reaction (PCR), Chemiluminescence Immunoassay (CLIA)