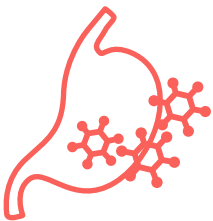


What Can Clinicians and Patients Expect from Healthpath Gut Health Testing?

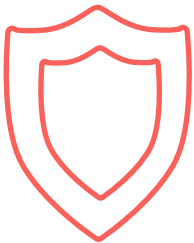
The Healthpath Gut Test shows you what's going on in your gut. By looking at imbalances in bacteria, yeasts, parasites and other intestinal health biomarkers, you find out what's contributing to your symptoms. You also receive targeted diet, supplement and lifestyle recommendations to help you take back control.

The biomarkers provide clinical information on three key areas:



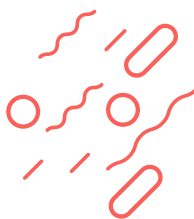
1 | Digestion/Absorption

- pH
- Pancreatic elastase
- Zonulin



2 | Immune activity/Inflammation

- Calprotectin
- Haemoglobin
- Secretory IgA
- H. Pylori
- Archaea/methanogens
- E. Coli, Lactobacillus species, Enterococcus species
- Akkermansia muciniphila, Faecalibacterium prausnitzii



3 | Gut Microbiome/Mycobiome

- Microbiome diversity
- Enterotype
- Dysbiosis index
- Actinobacteria
- Bacteroidetes
- Firmicutes
- Proteobacteria
- Fusobacteria
- Verrucomicrobia
- Hydrogen-sulphide production
- Oxalate-degrading bacteria
- Yeasts/moulds
- Parasites
- Helminths



Clinical Advantages of The Healthpath Gut Health Test qPCR Technology

This new method of analysis allows for a single sample. This makes the process easier for everyone, and it's particularly helpful for children and those struggling with diarrhoea or constipation.

	Gut Health Test	Advanced Gut Health Test Pro
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	Gut Health Test	Advanced Gut Health Test Pro
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Stool properties

Colour	✓	✓
Consistency	✓	✓
pH	✓	✓

Diversity:

Your diversity is key, which is why our microbiome analysis covers hundreds of parameters. High bacterial diversity is known to protect against intestinal infections. But low bacterial diversity is common, especially in disease states or after a course of antibiotics. When diversity is low, opportunistic bacteria like pathogens, fungi and viruses can proliferate.

Rather than focusing on individual species, it's more important to investigate how the different bacteria interact. Together, they're responsible for a host of intestinal functions.

Biodiversity

Diversity	✓	✓
Dysbiosis index	✓	✓

There are four large phyla (groups) of bacteria: Bacteroidetes, Firmicutes, Actinobacteria and Proteobacteria. We also report on two smaller, clinically relevant phyla: Verrucomicrobia and Fusobacteria.

Bacterial distribution

Actinobacteria	✓	✓
Bacteroidetes	✓	✓
Firmicutes	✓	✓
Fusobacteria	✓	✓
Proteobacteria	✓	✓
Verrucomicrobia	✓	✓
Other	✓	✓
Firmicutes/ Bacteroidetes Ratio	✓	✓

Enterotype:

Recent research suggests there are three different types of gut microbiomes, known as 'enterotypes'. Not only do the different enterotypes influence the absorption of minerals, but they also have different metabolic properties.

Enterotype 1 has high levels of Bacteroides species, which use fat and protein effectively. Enterotype 2 has a strong Prevotella population, which is better at metabolising carbohydrates. Enterotype 3 is the rarest enterotype. It has high levels of Ruminococcus flora, though we don't yet know which macronutrients it prefers.

Enterotypes aren't affected by a person's age or gender and they remain stable for years. They can be influenced, however, by a long-term change of diet and by taking prebiotics.

Enterotype

1, 2 or 3	✓	✓
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Actinobacteria

Bifidobacteria	✓	✓
Equol-producing bacteria	✓	✓
Adlercreutzia species		✓
Eggerthella lenta		✓
Slackia species		✓

Bacteroidetes

Bacteroides	✓	✓
Prevotella	✓	✓
Prevotella copri	✓	✓

	Gut Health Test	Advanced Gut Health Test Pro
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Firmicutes:

Butyrate is a short-chain fatty acid that's produced by bacteria in the colon. It's quickly absorbed by the intestinal mucosa, which means the only reliable way to measure it is to look at the number of butyrate-producing bacteria.

Firmicutes bacteria are key butyrate producers. One of these, *Faecalibacterium prausnitzii*, typically makes up 5–15% of human intestinal bacteria. This important butyrate-producing species has anti-inflammatory properties—so much so that an absence of *Faecalibacterium prausnitzii* typically correlates with higher levels of inflammation.

Firmicutes

Butyrate-producing bacteria	✓	✓
Faecalibacterium prausnitzii	✓	✓
Eubacterium rectale	✓	✓
Eubacterium hallii	✓	✓
Roseburia species	✓	✓
Ruminococcus species	✓	✓
Coprococcus	✓	✓
Butyrivibrio species		✓
Cl. butyricum		✓
Total bacterial count	✓	✓
Clostridia	✓	✓
Clostridia total bacterial count	✓	✓
Clostridia cluster 1	✓	✓
Clostridia histolytium		✓
Clostridium perfringens		✓
Clostridium sporenges		✓
Other		✓
Christensenellaceae		✓
Dialister invisus		✓

Fusobacteria

Fusobacterium species	✓	✓
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Verrucomicrobia

Akkermansia muciniphila	✓	✓
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	Gut Health Test	Advanced Gut Health Test Pro
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Proteobacteria

Potentially pathogenic bacteria	✓	✓
Haemophilus	✓	✓
Acinetobacter	✓	✓
Escherichia coli biovars	✓	✓
Proteus species	✓	✓
Proteus mirabilis		✓
Klebsiella species	✓	✓
Klebsiella pneumoniae		✓
Enterobacter species	✓	✓
Serratia species	✓	✓
Hafnia species	✓	✓
Morganella species	✓	✓
Campylobacter species		✓
Providencia species		✓
Citrobacter species		✓
Histamine-producing bacteria	✓	✓
H2S production	✓	✓
Hydrogen-sulphide production: Bacterial metabolism isn't always a good thing. Some bacteria reduce sulphate to create hydrogen sulphide—a toxic metabolic by-product that can damage the gut lining. The species <i>Bilophila wadsworthii</i> , <i>Desulfomonas pigra</i> and <i>Desulfovibrio piger</i> are thought to be potent hydrogen-sulphide developers.		
Sulphate-reducing bacteria	✓	✓
Desulfovibrio piger		✓
Desulfomonas pigra		✓
Bilophila wadsworthii		✓
Oxalate-degrading bacteria		✓
Oxalobacter formigenes		✓

Archaea:

Archaea have been overlooked in microbiome studies until recently. New research suggests that 1) archaea are part of the microbiome in plants, animals and humans, 2) they form biofilms and 3) they interact with the human immune system. Some archaea are also methanogens, which may play a role in chronic constipation.

Archaea

Methanobrevibacter	✓	✓
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	Gut Health Test	Advanced Gut Health Test Pro
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Immunogenically effective bacteria

Escherichia coli	✓	✓
Enterococcus species	✓	✓
Lactobacillus species	✓	✓

Mucin production/mucosal barrier:

A healthy colon has a protective mucous layer. If this layer is damaged—or only small amounts of mucous are produced—pathogens, pollutants and allergens can come into direct contact with the mucosa. This leads to inflammation.

The bacterium Akkermansia muciniphila is important because it encourages goblet cells to produce this protective mucous. Parts of this mucous also provide a special type of carbohydrate called oligosaccharides, which feed the bacteria that make gut-healing butyrate. With the right bacteria, it becomes a virtuous circle!

Mucin production/mucosal barrier

Akkermansia muciniphila	✓	✓
Faecalibacterium prausnitzii	✓	✓

Yeasts/moulds

Candida albicans	✓	✓
Candida species	✓	✓
Geotrichum candidum	✓	✓
Moulds	✓	✓

Functional markers

Calprotectin	✓	✓
Haemoglobin in faeces immunologically	✓	✓
Secretory IgA	✓	✓
Pancreatic elastase	✓	✓
Zonulin		✓

	Gut Health Test	Advanced Gut Health Test Pro
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Parasites:

The Multiplex Real-time PCR (Multiplex quantitative real-time PCR) is a faster and more effective method for detecting parasites. This new test:

- provides reliable analysis, even with minimal attack
- gives no false positives with non-pathogens
- can be sent out with regular mail
- gives reliable results in symptom-free patients and also after treatment

Parasites

Pathobionts	✓	✓
Blastocystis hominis	✓	✓
Dientamoeba fragilis	✓	✓
Helicobacter AG	✓	✓
Pathogenic intestinal protozoa	✓	✓
Giardia lamblia	✓	✓
Entamoeba histolytica	✓	✓
Cryptosporidium species	✓	✓
Cyclospora cayetanensis	✓	✓
Helminths COMING SOON		✓
Taenia species		✓
Taenia solium		✓
Taenia saginata		✓
Ascaris species		✓
Enterobius vermicularis		✓
Ancylostoma species		✓
Ancylostoma duodenale		✓
Hymenolepis species		✓
Hymenolepis nana		✓
Hymenolepis diminuta		✓
Trichuris trichiura		✓
Necator americanus		✓
Strongyloides species		✓
Strongyloides stercoralis		✓
Microsporidia		✓
Enterocytozoon species		✓
Encephalitozoon species		✓

Example report

External ID

Name	-	Date of Birth	26.07.1977	Order ID	11399854
First Name	-	Sex	Female	Order Date	09.01.2018
Sampling Date	09.01.2018 11:59	Validation Date		Findings Status	Final Report
Sample Material	FE	Validation on	09.01.2018	Findings Date	17.01.2018

Test	Result	Unit	Standard Range	Previous Result
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Stool Diagnostics

Moleculargenetic Microbiomeanalysis MAXI

Stool Properties

Colour	lightbrown			FE NA) VISU
Consistency	mushy			FE NA) VISU
pH	6,0		5,8 - 6,5	FE NA) TESTS

Biodiversity

Diversity	5,63		> 5,0	FE NA) MGSEQ
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The bacterial diversity in the intestinal tract may vary considerably from person to person. Antibiotic therapies, infections, increasing age, unbalanced diets or smoking are causes of declining diversity.

Grad



Bacteria Phyla (Distribution)

Actinobacteria	1,6	%	1,0 - 5	FE NA) MGSEQ
Bacteroidetes	31,3	%	30 - 60	FE NA) MGSEQ
Firmicutes	60,2	%	30 - 60	FE NA) MGSEQ
Fusobacteria	0,0	%	0,0 - 1,0	FE NA) MGSEQ
Proteobacteria	3,5	%	1,5 - 5,0	FE NA) MGSEQ
Verrucomicrobia	1,0	%	1,5 - 5	FE NA) MGSEQ
Other	2,4	%		FE NA) MGSEQ

Ratio

Firmicutes/Bacteroidetes	1,93	Quotient	< 1,5	FE NA) RECHN
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Enterotype

Bacteroides				FE NA) MGSEQ
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Human intestinal microbiomes can be differentiated into three Enterotypes. Enterotypes are defined by dominant bacterial clusters with distinct metabolic properties.

Enterotyp



Dysbiosis index

The dysbiosis index represents a measure of deviations within the microbiome. Depending on their relevance, all detected phyla, genera and species are considered.



Index



Test	Result	Unit	Standard Range	Previous Result
Bacteria Phyla - most important genera and species				
Actinobacteria				
Bifidobacteria	1,5 x 10^10 CFU/g faeces		> 5,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Bifidobacterium adolescentis	53	%		FE NA) MGSEQ
Bifidobacterium longum	27	%		FE NA) MGSEQ
Equol producing bacteria	8,1 x 10^8 CFU/g faeces		> 5,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Adlercreutzia spp.	<div></div>			FE NA) MGSEQ
Eggerthella lenta	<div></div>			FE NA) MGSEQ
Slackia. spp.	<div></div>			FE NA) MGSEQ
Bacteroidetes				
Bacteroides	1,8 x 10^11 CFU/g faeces		> 1,5 x 10^11	<div><div></div></div> FE NA) MGSEQ
Bacteroides uniformis	31	%		FE NA) MGSEQ
Bacteroides ovatus	8	%		FE NA) MGSEQ
Prevotella	6,0 x 10^7 CFU/g faeces		> 1,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Firmicutes				
Butyrate producing bacteria				
Faecalibacterium prausnitzii	9,2 x 10^10 CFU/g faeces		> 5,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Eubacterium rectale	1,8 x 10^10 CFU/g faeces		> 1,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Eubacterium hallii	1,3 x 10^9 CFU/g faeces		> 5,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Roseburia spp.	2,9 x 10^9 CFU/g faeces		> 2,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Ruminococcus spp.	6,2 x 10^10 CFU/g faeces		> 3,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Coprococcus	8,4 x 10^9 CFU/g faeces		> 2,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Butyrivibrio spp.	5,0 x 10^8 CFU/g faeces		> 5,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Cl. butyricum	1,0 x 10^9 CFU/g faeces		> 1,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Total bacterial count	1,8 x 10^11 CFU/g faeces		> 1,3 x 10^11	<div><div></div></div> FE NA) MGSEQ
Clostridia				
Clostridia total bacterial count	3,2 x 10^9 CFU/g faeces		< 4,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Clostridia cluster I	< 1,0 x 10^6 CFU/g faeces		< 2,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Clostridium histolyticum	< 1,0 x 10^6 CFU/g faeces		< 2,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Clostridium perfringens	< 1,0 x 10^6 CFU/g faeces		< 1,0 x 10^8	<div><div></div></div> FE NA) MGSEQ
Clostridium sporogenes	< 1,0 x 10^6 CFU/g faeces		< 1,0 x 10^8	<div><div></div></div> FE NA) MGSEQ
Other				
Christensenellaceae	1,7 x 10^8 CFU/g faeces		> 1,0 x 10^9	<div><div></div></div> FE NA) MGSEQ
Dialister invisus	< 1,0 x 10^6 CFU/g faeces		< 4,0 x 10^10	<div><div></div></div> FE NA) MGSEQ
Fusobacteria				
Fusobacterium spp.	< 1,0 x 10^6 CFU/g faeces		< 1,0 x 10^7	<div><div></div></div> FE NA) MGSEQ
Verrucomicrobia				
Akkermansia muciniphila	9,6 x 10^9 CFU/g faeces		> 5,0 x 10^9	<div><div></div></div> FE NA) MGSEQ

FE=Stuhl

Overview - Results and Therapy Options



pH		
Enterotype	1	check vitamin A. E, iron and calcium supply
Biodiversitiy		
Ratio Firmicutes/Bacteroidetes		Low Carb Diet, prebiotics (scFOS/scGOS)*
Equol producing bacteria		
Butyrate producing bacteria		prebiotics on the basis of resistant starch* or scFOS/scGOS*
Mucus production		
Mucosa integrity		
Milieu stabilising bacteria		
Immunogenic bacteria		immunogenic effective probiotics*
Clostridia - total bacteria count		
Clostridia cluster I		
H2S producing bacteria (SRB)		
Potentially Pathogenic Bacteria		
Candida (facultive pathogenic)		
Oxal decomposing bacteria		low-oxalate diet