

10th February 2022

**Report of Findings Consultation - Metabiome stool test**

**Practitioner: Brooke Hughes**

Thank you for requesting my assistance. Based on the signs and symptoms you have described, I believe there are some imbalances in your digestive system - this may be overgrowth of bacteria that shouldn't be there, not enough beneficial bacteria, overgrowth of yeast, parasites, and/or leaky gut. It is impossible to know exactly what is going on in the gut without assessing a stool sample. This is why I have recommended that you complete a Metabiome test. This test provides us with information that allows us to target exactly what is going on in your gut.

Naturopaths and a lot of Doctors now are aware that the health of the gut determines the health of the rest of the body - including the skin, immune system, mental health (stress and anxiety).

Thank you for completing the Metabiome. Your results can assist me to develop a specific treatment plan, which can help to address issues more quickly and effectively.

Your result has shown what is termed '**Dysbiosis**'. An overgrowth of opportunistic bacteria, coupled with an undergrowth of beneficial bacteria. We will follow is termed a "weed, seed, feed" protocol. It is essentially removal of excess fecal buildup and dysbiotic bacteria and yeast, seeding of good bacteria and feeding the good bacteria and your digestive cells. This process can take anywhere from 2-5 months depending on your severity and your due diligence. Dietary recommendations for this are:

*DURING WEEDING PHASE = first 1-2 months*

1. Follow therapeutic diet.

*DURING SEEDING + FEEDING PHASE - following 2-3 months*

2. Follow handout 'Gelatin for gut health'
3. Consider drinking unsweetened aloe vera juice daily to support healthy elimination of fecal buildup. My recommended brand is Aloe Vera of Australia.
4. If, as part of this process, your digestive functions changes undesirably, please cease treatment and contact the clinic for reassessment.

Please remember the digestive system does a lot more than just digest food. It assists in the elimination of excess hormones, toxins, chemicals and bacteria. There is also a very well known connection between the gut and the brain. You may have heard that the gut is called the "second brain" because it is also called the Enteric Nervous System. The bacterias and nerves in the gut likely influence the way you think and feel. For more information you could follow the likes of Dr Natasha Campbell-McBride who formulated what is known as Gut and Psychology Syndrome (GAPS). Above all else, the gut is where you absorb all the goodness from your food. As the saying goes, "you are what you eat". I like to go one step further and say, "you are what you eat, digest and absorb!".

## Metabiome score - 98

This score is taken from 11 core factors that influence and determine gut health. We are aiming for a score of 98-100, however, even these high scores don't necessarily mean that everything in your gut is balanced. There could still be areas that may contribute to your symptom picture and need addressing.

### Low Short Chain Fatty Acids (SCFA) - butyrate, Acetate, Propionate

When your friendly gut bacteria ferment fibre and starches in your colon they produce SCFAs. These SCFAs fuel our gut cells, dampen inflammation, heal the gut and play many other roles such as influencing insulin sensitivity, energy production and immunity.

Low levels of SCFA's indicate either a low quantity of the microbes responsible for creating them or that the microbes are not being fed enough of the starches or fibres needed for them to make the SCFA's. Your practitioner will advise which foods you should focus on increasing.

### Low Butyrate

Butyrate is vital for gut health as it is the main source for your gut cells.. It is also involved in maintaining a healthy gut barrier and deterring pathogenic bacteria making butyrate protective against inflammation and intestinal permeability. It helps control appetite, balances blood glucose levels and stimulates the production of serotonin from our gut cells (gut-brain axis → low serotonin can be linked with anxiety and depression).

**DIET STRATEGY:** Consuming foods high in resistant starch (e.g. lentils, peas, beans, cooked and cooled potatoes, rolled oats) or pectin (e.g. avocado, kiwifruit, berries, citrus fruits, pumpkin, zucchini) have been shown to increase butyrate levels.

### Low Normal Acetate

Acetate is the most abundant short chain fatty acid produced by our gut microbiome. It plays an important role in fat metabolism, glucose metabolism and the immune system. Several bacterial species can also convert acetate to the beneficial short chain fatty acid, butyrate.

### Low Propionate

The main roles of propionate in the gut is to regulate appetite, regulating blood glucose levels and inflammation control.

Propionate is among the most common short-chain fatty acids produced in the human gut in response to indigestible carbohydrates (fiber) consumed in your diet. Other effects of propionate include:

- In the gut it stimulates smooth muscle contractions,
- It increases mucus secretion,
- It promotes antimicrobial peptide expression,
- It dilates colonic arteries,
- It increases release of serotonin from gut endocrine cells.
- Regulate appetite
- Regulate blood glucose levels
- Regulate inflammation

**DIET STRATEGY:** The prebiotic fibre beta-glucan, found in oats and barley, has been shown to increase propionate production.

### **Low Normal Fibre Degradation**

**Fibre (correct types) = fuel for our beneficial gut bacteria.** Fibre-consuming bacteria are responsible for producing important by-products such as short chain fatty acids which play a critical role in keeping the gut healthy. As we know diversity is key to a healthy gut microbiome. Therefore, the more different types of fibres the more good bacteria will grow. The more good bacteria we have the more they produce beneficial metabolites such as SCFAs. Vice versa if we don't eat sufficient fibre as well as, a good variety of fibres and/or we don't have enough fibre degrading bacteria it may result in inflammation and intestinal permeability. Specific prebiotic fibres will promote the growth of beneficial bacteria.

### **Low normal 3-indolepropionic acid (IPA)**

3-indolepropionic acid (IPA) is a beneficial substance produced by some gut bacteria when they break down the amino acid tryptophan. It is a strong antioxidant that can help protect the nervous system from damage. Research is showing IPA production to improve intestinal barrier function and modulate immune function and inflammation.

Bacteria including *Bifidobacterium* spp, *Peptostreptococcus russellii* and *Lactobacillus* spp. Have been shown to contribute to tryptophan metabolism and IPA production.

### **High normal Histamine**

Histamine can come from histamine containing foods but the more potent histamine comes from our mast cells that cause an inflammatory response when activated. These are associated with allergies, asthma, gut pain, food allergies, endometriosis and others. Microbes can contribute to the histamine load and production from the gut. Your practitioner will help with strategies to lower the histamine load.

### **Low Branched chain amino acids production**

Branched chain amino acids (BCAAs) are building blocks for muscles, are involved in the regulation of glucose and fat metabolism, and are involved in the regulation of the immune system. They can be obtained from your diet as well as from your gut microbiome. However, the right amount of BCAAs is important.

### **High Succinate Production**

Succinate is a metabolite produced by both human cells and the gut microbiome from the breakdown of carbohydrate fermentation that can build up during inflammation and dysbiosis in the intestine. Succinate is an important compound involved in glucose and protein metabolism and it is also involved in the production of the short chain fatty acid, propionate. In low levels it can be beneficial, however, too much may not be a good thing. High levels of succinate in the blood have been observed in individuals with obesity, heart disease and type 2 diabetes. Several studies show links between dysbiosis, succinate accumulation in the gut, and inflammation.

### **Low normal Tyramine**

Tyramine is a chemical that is produced from the breakdown of the amino acid tyrosine. Tyramine produced by your gut microbiota in the large intestine can stimulate serotonin production in the gut. This is involved in increasing gut motility. *Lactobacillus* spp and *Enterococcus* spp are both able to produce Tyramine.

Tyramine is only one of several compounds that can stimulate serotonin production in the gut. Other compounds include butyrate, propionate and vitamin E.

More than 90% of the body's serotonin is produced by cells in the gut, where it plays an important role in many bodily functions such as the immune response, gut motility, bone development, and cardiac function. Only about 10% of the body's serotonin is produced in the brain, where it is used to regulate mood, appetite and sleep. Consuming a sufficient amount of fibre, including fruits and vegetables, can help support serotonin production in your gut.

#### **Low Folate**

Folate or folic acid plays an important role in cell replication and repair as well as immune, nervous system and metabolic health. Folate cannot be produced by human cells and must be obtained through diet or from the microbiome. The large intestine has the ability to absorb folate produced by the gut microbiome and it is estimated that the human gut microbiome can provide up to 37% of the daily folate requirement. Deficiencies can result in an increased risk of heart disease, anemia, stroke, and neural tube defects in newborn infants.

**DIET STRATEGIES:** Rich dietary sources include dark green leafy vegetables, fruit, legumes, and nuts.

#### **Low Oxalate Consumption**

Calcium oxalate is a common component of kidney stones. People who suffer from repeated unexplained kidney stones have been observed to have a reduced level of genes for oxalate degradation in their microbiome compared to healthy people.

#### **High Akkermansia spp**

The main fuel source of this bacteria is mucus - it lives in the mucous layer of the gut and regulates the turnover to maintain the integrity of the gut. Generally prevalence of Akkermansia spp is linked with health. However, high levels can also lead to inflammation due to the "over eating" of the mucus layer leading to intestinal permeability.

#### **Low Bifidobacterium spp**

This is one of the most well researched and beneficial bacteria spp in the gut. They function to stabilise tight junctions and inhibit invasion of human intestinal epithelial cells by enterovirulent bacteria. Inhibit mucosal adhesion of enteropathogens by competitive exclusion.

**DIET STRATEGY:** A fibre rich plant based whole food diet with polyphenol rich foods, prebiotic like and rich foods and resistant starches is needed. The prebiotics lactulose, fos, gos, PHGG and Acacia fibre (all work best combined) are very effective in bringing up levels of this bacteria though PHGG has limited effectiveness on its own in increasing the population of bifidobacteria.

Polyphenols are the colourful foods such as berries, cherries, nuts and seeds, red apples, purple vegetables, coloured grains, olives - 95% of polyphenols are not absorbed by us but utilised by microbes for food

Prebiotic like foods – have been shown to encourage growth of bifidobacteria and include brown rice, carrots, black currants, dark cocoa, almonds (skin on) and green tea.

## Low *Faecalibacterium prausnitzii*

*Faecalibacterium prausnitzii* is one of the most abundant bacterial species found in the gut and plays a potentially important role in promoting gut health. *Faecalibacterium prausnitzii* has been consistently reported as one of the main butyrate producers found in the intestine and it has protective properties against colorectal cancer and inflammatory bowel diseases. There is an increasing number of studies reporting on *F. prausnitzii* depletion in relation to various GIT conditions which has prompted interest in considering this bacterium as a new generation probiotic. Although most *F. prausnitzii* strains are able to ferment inulin to increase their numbers, it appears apple pectin is the most effective. In addition, *F. prausnitzii* strains can also utilise N-acetylglucosamine and it has been reported that treatment with this compound may improve Crohn's disease, as it will serve as a healing factor in inflamed, damaged soft tissues of the gut.

Low levels of this bacteria has been associated with inflammatory conditions and metabolic conditions. This bacteria uses fiber, resistant starch, simple sugars and acetate and produces lactate, ethanol and the SCFAs acetate and butyrate.

**DIET STRATEGY:** Eat prebiotic rich foods, diets rich in fibre especially legumes. Inulin. Dietary polyphenols such as grape and probiotic strains of *Bacillus coagulans* GBI-30 6086 BS and *Bifidobacterium longum* BB536 will also increase *Faecalibacterium prausnitzii*.

## High *Bacteroides* and High *Firmicutes*

### Commensal bacteria - Classes of bacteria – *Firmicutes*, *Bacteroides*, *Actinobacteria*, *Proteobacteria*

Gram-negative *bacteroides* and gram-positive *firmicutes* dominates digestive tract, mouth, nose, throat. In recent research, the *firmicutes* and *bacteroidetes* classes of gut bacteria have received a lot of attention. Multiple studies show that obese people have a higher concentration of *firmicutes* than *bacteroidetes*, while in lean people the *bacteroidetes* predominate (to help keep it straight, think of *firmicutes* as “fat” and *bacteroidetes* as “bony”). Moreover, when the diet is high in fat, the *firmicutes* increase (the exception being a ketogenic diet), yet a high-fiber diet helps *bacteroidetes* increase. In addition, researchers observed that overgrowth of *firmicutes* led to chronic systemic inflammation, which is known to contribute to common health problems such as metabolic syndrome, diabetes and heart disease. **The message: Though they both have jobs to do, you want your *bacteroidetes* to be stronger than your *firmicutes*. One way to help with this ratio is to increase your fibre intake.**

## *Pathogenic Bacterial Species*

**General** - Your report shows high levels of species that have been associated with poor gut health and high levels of a species that have been observed in motorneuron conditions. Your report also shows species that are usually found orally and so indicates low stomach acid as they are able to survive the stomach and move to the colon.

## High *Methanobrevibacter\_A smithii*

This microbe is a methanogen. Methanogens are not bacteria but are Archaea and they produce acetate, branched chain amino acids, histamine and methane. In the gut, methane can cause motility disruption in the small intestine as it affects the Migrating Motor Complex (MMC), a cleansing wave of electrical signals that aids in digestion and that moves microbes down the small intestine into the large intestine. This is important

as we don't want a build up of bacteria in the small intestine. High levels of *Methanobrevibacter\_A smithii* in the colon can cause excess methane production and lead to constipation and/or bloating.

**DIET STRATEGY:** To support the MMC avoid snacking in between meals. Prokinetics may be used.

### High *Bilophila wadsworthia*

We want no more than 0.01% of our gut bacteria to be *Bilophila* - yours is 0.05%. High *Bilophila* is associated with a high fat diet. It can contribute to hydrogen sulphide production. It promotes inflammation and intestinal permeability.

**DIET STRATEGY:** Short term reduction of animal and saturated fat intake. Avoid dairy.

### High *Desulfovibrio*

This is another bacteria that we only want very low amounts of. The genomic analysis shows that most members of this species can consume: GABA.

*Bilophila* and *Desulfovibrio* are sulphur producing bacteria. Many Bacteroidetes are also bile acid consumers so if we eat fat, this increases our bile acids and then we feed the Bacteroidetes further. *Desulfovibrio*, *Bilophila*, *Alistyces* and *Bacteroides* are most impacted by a higher fat intake so it is important to decrease fat in the diet in order to decrease these populations.

**DIET STRATEGY:** Short term reduction of animal and saturated fat intake. Avoid high-sulphur plant based foods (onions, garlic, chives), cruciferous vegetables and beans/pulses. Garlic, onions, egg and kale.

### High *Blastocystis sp. subtype 1*

The role this species has in human health is controversial. The reason is that *Blastocystis* subtypes 1-4 are commonly detected in both healthy and diseased individuals and most individuals who carry *Blastocystis* have no symptoms. Additionally, *Blastocystis* does not have commonly recognised pathogenic properties and its presence is often associated with a higher bacterial diversity. Further research needs to be conducted to clarify the role this microbe plays in the gut microbiome

### Low *Escherichia* spp.

Organism of the Proteobacteria phylum. *Escherichia coli* (*E. coli*) is the primary species in this genus, and most are nonpathogenic. Pathogenic strains can lead to IBS, urinary tract infections, small intestinal bacterial overgrowth amongst others. Low levels may indicate reduced mucosal health and decreased protection against pathogenic *E. coli*. *Escherichia* are also responsible for producing norepinephrine, serotonin and dopamine. An estimated 95% of serotonin is produced in the gut largely by *Escherichia coli* strain Nissle. Serotonin levels can influence and regulate gut function and motility and also via the gut-brain axis, influence behaviour and brain function

### Suspected Leaky Gut

Above and beyond all is nutrient absorption! The gut is central to good health. So for health to go out of balance there are three factors that we consider, how you eat, how you live and how you think. All three of these affect gut function. If nutrient absorption is a little suboptimal you may end up with nutrient deficiencies of suboptimal levels.

Leaky gut (also known as intestinal permeability) is when the lining of the gastrointestinal tract becomes damaged, and tiny gaps develop between the cells of the gut lining. These gaps allow substances (such as food particles and toxins) to escape the digestive system and enter into the bloodstream. Common causes of leaky gut include food intolerances, chronic stress, excess alcohol and sugar intake, and some medications.

Your test results have indicated that the lining of your gastrointestinal tract may be compromised, which can cause poor absorption of nutrients and nutrient deficiencies, food sensitivities/allergies, skin disorders, poor energy, altered mood, and autoimmune disorders. We now need to work to heal the gut lining, which we will aim to address by:

1. Removing potential causes of leaky gut - managing stress levels (and addressing unnecessary sources of stress), reducing intake of foods that irritate the gut lining (e.g. alcohol, sugar, gluten, dairy), and improving the levels of beneficial bacteria in your gut through increasing your intake of fermented foods and/or using a high quality probiotic supplement.
2. Using nutrients and foods therapeutically to heal the gut lining. I may also prescribe nutrient formulas that are specifically made to improve the strength of the gut lining.

Thank you again for kindly engaging me on your health journey, I am humbled that you have chosen me and I am looking forward to continuing on this path to wellness with you.

Warm regards,

Brooke Hughes

