The Gut Microbiome

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MOST PEOPLE WOULD HAVE HEARD THAT MAINTAINING A HEALTHY BALANCE OF BUGS IN THE GUT HAS BEEN LINKED WITH HEALTH.

The gut microbiota contains roughly 100 trillion micro-organisms and is now referred to as another organ of the body. The gut microbiota manufactures thousands of metabolites which interact with the body and can be associated with either healthful outcomes or disease.

LOW GUT MICROBIAL DIVERSITY

Lower microbial diversity has now been associated with obesity, inflammatory bowel disease, eczema, type 2 diabetes, depression, anxiety and immune dysregulation, coeliac disease, irritable bowel syndrome, childhood asthma, eczema, chronic fatigue syndrome, Alzheimer's disease, non-alcoholic fatty liver disease, high cholesterol and triglycerides.Some of the signs of imbalance can include bloating, constipation, pain and diarrhoea.

HIGH GUT MICROBIAL DIVERSITY

High microbial diversity, in contrast, is linked with improved fat metabolism, better insulin resistance, immune tolerance, normal gut motility and a greater resistance against environmental influences so greater diversity is a good indicator of a healthy gut (Clapp et al., 2017; Valdes et al., 2018; Zeng et al., 2020).

FACTORS CAUSING IMBALANCE

Factors responsible for an imbalanced microbiome (dysbiosis) include diet, particularly the low fibre, high fat, high sugar western diet, lack of exercise, drugs including antibiotics, NSAIDS, proton pump inhibitors and xenobiotics, chemotherapy, smoking and artificial sweeteners (Valdes et al., 2018).

Stress has also been shown to reduce health promoting bacteria and may induce dysbiosis and gut barrier permeability which can then compound mood disorders in a vicious circle (Madison et al., 2019).

While our gut diversity can be influenced by our genes, dietary changes may explain 57% of the total structural difference in gut microbiota whereas genetic changes account for no more than 12%. This indicates that diet has a governing role in shaping gut microbiota and changing key microbial populations may change a healthy gut microbiota into a disease-inducing environment (Brown et al., 2012).

HOW DOES THE MICROBIOTA SUPPORT HEALTH?

The microbiota ferments dietary fibre which supports special microbes that make short chain fatty acids (SCFA), especially acetate, propionate and butyrate. One of the jobs SCFAs do is protect against pathogenic bacteria colonisation which cause gastrointestinal infections (Sun and O'Riordan, 2013).

Butyrate, specifically, is the main food for your intestinal cells and can protect gut barrier function and reduce the chance of microbial cell wall components like lipospolyschaccharides (LPS) entering into the blood which can create low grade systemic inflammation.Butyrate can also positively influence glucose and energy metabolism and help kill colon cancer cells (Valdes et al., 2018).

Propionate, via the liver, can influence satiety signalling (your body telling you when your full) (Valdes et al., 2018).

Acetate is a fuel for other important bacteria and supports cholesterol metabolism and appetite regulation.Studies have shown that the higher the level of SCFA, the lower the obesity (Valdes et al., 2018).

Importantly the microbiome can also interact with the brain. For instance, some bacteria have been shown to produce calming neurotransmitters such as serotonin and GABA and dopamine. The microbiota has also been found to communicate with the brain via the vagus nerve and has the capacity to modulate our stress response (Madison et al., 2019).

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HOWEVER, THERE ARE OTHER METABOLITES PRODUCED BY THE MICROBIOTA THAT ARE ASSOCIATED WITH LESS HEALTHFUL OUTCOMES.

For instance, trimethylamine, produced by some microbes in the fermentation of meat and dairy is associated with an elevated risk of cardiovascular disease (Valdes et al., 2018).

As mentioned, some bacteria (specifically gram negative bacteria) produce large amounts of LPS. In those with good intestinal integrity, a balanced microbial ecosystem and a fibre rich diet, only small amounts of LPS are in the blood. In those with compromised intestinal integrity LPS absorption is increased, potentially driving systemic inflammation and one possible link between gut health and mood disorders (Hawerlack, n.d;Limbana et al., 2020).

Some bacteria also produce hydrogen sulphide which is toxic to your colon cells and have been shown to increase the risk of colorectal cancer, and inflammatory bowel disease.

The gut microbiome is also a regulator of circulating estrogens through the secretion of beta-glucuronidase and high levels of beta-glucuronidase leads to elevated levels of circulating estrogens which can influence conditions such as endometriosis, endometrial hyperplasia and some cancers (Baker et al., 2017).

CAN I TESTS MY MICROBIOME?

Yes you can but take care because many of the tests available are not testing the true diversity of your microbiome. They are either just focussing on the less healthful bacteria or they are using scientific techniques which fail to culture the complete microbiome, potentially excluding large populations of bacteria that could influence a diagnosis.In both cases this could lead to invasive herbal and conventional antibiotic treatment that may damage your good bacteria as well as the bad.

The best testing methods for measuring diversity are with molecular approaches such as 16S rRNA sequencing and Shotgun Metagenomic Sequencing. I can help organise microbiome testing for you and assist in its interpretation to fine tune your diet for your specific microbiome characteristics.

PRACTICAL TIPS TO SUPPORT MICROBIAL DIVERSITY

1. Take a prebiotic supplement every day to feed healthy bacteria. For instance, lactulose, partially hydrolysed guar gum (PHGG), galactooligosaccharides (GOS), and/or Fructooligosaccharides (FOS).

2. Eat a diverse range of multicoloured whole plant foods weekly. The ideal is 30+ different whole plant foods a week. Include:

a. Foods rich in polyphenols. Polyphenols reach the large intestine where they may exert prebiotic like effects and have antimicrobial action against harmful bacteria (Kumar et al., 2019). Foods include: green tea, cocoa powder, dark chocolate ,colourful vegetables such as purple carrots, red potatoes, red onions, broccoli, red rice, black quinoa, black olives and olive oil and fruits such as blueberries, cherries, strawberries, raspberries, red apples, nuts and seeds including flaxseed meal, chestnuts, hazelnuts, pecans and black tahini

b. Consume prebiotic foods rich in FOS and GOS

- FOS – garlic, onions, asparagus, globe artichokes, Jerusalem artichokes, chicory
- GOS – Legumes, beans, rye sourdough, sunflower seeds, pumpkin seeds, LSA, brassica-family vegetables
- Consume resistant starch foods (starch that resists digestion in the small intestine) – cooked and cooled potatoes and rice and pasta, legumes, unripe bananas, oats, chickpeas, white beans and kidney beans

3. Avoid foods that favour a less healthy gut microbiome

- High refined sugar, high fat, highly processed foods, smoked meats, excessive alcohol and excessive meat derived from protein. When you do have meat ensure it is accompanied by a large serve of colourful vegetables

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4. Exercise moderately, and

5. Avoid excessive stress (Hawerlack, n.d).

CONCLUSION

Probiotic supplements will help many conditions but it's important to note they only improve the diversity temporarily!! They do not colonise so need to be combined with prebiotic therapy. Want to know more please reach out at:

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