Carbohydrates from fruit, vegetables and legumes and wholegrain products are the main source of food for gut bacteria

Gut bacteria: feeding our friends within

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Microbiota – what, where and why?

Let's start at the beginning with a few basics: 'Microbiota' is the new name for what we used to call "gut flora". Although in layman's terms we often use the phrase "gut bacteria", the term microbiota encompasses more than just bacteria. It includes bacteria, yeast, fungi and viruses: all found in our bodies. For ease in this article, we will just refer to bacteria as they make up the largest proportion of microbiota. Another word you might hear is 'microbiome'. This is the term given to the genetic material of the microbiota. And there are more of them than you! The largest concentration of gut bacteria is found in the large bowel, however there are bacteria found all throughout the digestive system – from the mouth down.

The majority of bacteria that we find in our intestines are of the phylum Bacteriodetes and Firmicutes. Actinobacteria, proteobacteria and verrucomicrobia are found in lesser amounts. What seems to be critical is the types of bacteria found as well as the ratio of one to another. For example, although Bacteriodetes and Firmicutes are both good, if there are too many Firmicutes phylum in relation to Bacteriodetes then inflammatory markers in the body can be increased. Some Clostridia bacteria are good and some are definitely not (for example *Clostridium difficile* causes dreadful diarrhoea, and the same with *E. coli*).

Because environmental, dietary, psychological and pharmacological factors affect our gut bacteria it is becoming harder to know what a healthy or normal bacterial picture is in the Western world. We now know that people with certain diseases or conditions have similar features in growth patterns and diversity of gut bacteria. For example, research has shown that people with Irritable Bowel Syndrome (IBS) have different bacterial populations than healthy individuals. The diversity of bacteria is reduced and the balance of gut bacteria species is changed.

We see gut bacteria playing an unexpectedly important role in mental health conditions. The gut–brain axis is the biochemical signalling that takes place between the gastrointestinal tract and the central nervous system. Much of this communication takes place with the help of gut bacteria. Chronic stress in adults can also affect gut bacteria and favours the growth of bacteria that influence inflammation. Chronic stress also loosens the tight junctions between epithelial cells in the intestines ('leaky gut'). A new treatment for some mental health disorders has been labelled "Psycho-biotics". These are probiotic strains that enhance brain function and act as therapies for psychiatric disorders.

Gut bacteria have also been shown to play a part in the development of allergies, asthma and eczema, obesity, diabetes (both type 1 and type 2), skin conditions and liver disease.

Prebiotics

With research showing how significantly gut bacteria can affect health we are starting to learn how to keep our gut bacteria happy and healthy. The aim is to have a microbiota that is diverse; is present in the right amount – not too much, not too little; has the correct ratio of Bacteriodetes to Firmicutes and a low number of pathobionts, which are normally-symbiotic bacteria that can be pathogenic in high numbers. Research has shown us that diet can have a huge impact on the health of our gut bacteria. Too much fat changes the ratio of bacteria to favour inflammatory conditions and a diet high in processed fat and sugar reduces bacterial diversity.

We call foods that help feed good bacteria "prebiotics". Research has shown us that a diet that is high in fibre or "Mediterranean-style" favours bacterial diversity. A Vegan diet has been shown to help reduce pathobionts). Carbohydrates from fruit, vegetables and legumes and wholegrain products are the main source of food for gut bacteria.

Probiotics

Whereas prebiotics are the food for bacteria, probiotics are actual bacteria which may be taken in capsule form or as a probiotic food. The evidence for the use of capsule probiotics can be variable as to

their effect on gut bacteria and composition. Often results vary because of the strains of probiotics given, due to study methods and the lack of a definition of what comprises healthy or normal microbiota. Studies have shown benefits of taking probiotic capsules for post infective diarrhoea, constipation, IBS, asthma and eczema. Probiotics can help reduce the attachment of pathogenic bacteria in the gut by promoting production of mucins, providing competition for growth materials and edging out pathogenic bacteria (by sheer volume of probiotics) and might change the intestinal eco-system to one that favours good bacteria.

Probiotic foods

There is huge public interest in fermented foods and natural probiotic foods. Kefir is a traditional fermented milk drink, similar to yoghurt. The bacteria digest the lactose and the resulting liquid is sour to taste and virtually lactose free. A pilot study published in 2014 in the *Turkish Journal of Gastroenterology* indicated that there might be benefit for people suffering with chronic constipation to take 500ml/day of milk kefir. Stool frequency was significantly increased, stool consistency was improved and laxative consumption was decreased. Colonic transit accelerated in the slow transit time constipation group and bowel satisfaction scores were increased.

Kimchi is an Asian version of sauerkraut where cabbage is fermented, usually with daikon radish, ginger and garlic. It is quite spicy! Typically it is served alongside Korean meals and traditionally it is thought to help reduce weight. Human research has now shown that eating kimchi can change gut bacteria to favour weight loss. Sauerkraut is a European form of kimchi based on fermented cabbage. The main bacteria found in sauerkraut is *Lactobacillus plantarum*. *L.plantarum* has been shown to breakdown oxalates (kidney stones), to exhibit antioxidant activities and maintain intestinal permeability. *L.planaturum* also produces neurotransmitters that may reduce depression.

Kombucha is a fermented black tea drink which has been shown to have anti-microbial and antioxidant properties. It has also been studied in relation to reducing diabetes risk, treating gastric ulcers and reducing cholesterol.

Finally

There are three main things to remember.

- Firstly, treat dysbiosis: IBS, depression, chronic inflammatory symptoms may all respond well to a Mediterranean-style diet.
- Stress can change gut bacteria for the bad: Don't stress. Relax. Be mindful. Take time out. Smell the roses. Consider food based probiotics and prebiotics.
- Feed gut bacteria the right food and health will benefit in the long run.

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