



Frequently Asked Questions on the Gut Microbiome

What do the terms gut microbiome, gut microbiota and gut flora mean?

Strictly speaking the term **microbiome** refers to the combined genetic material of all the microorganisms in a particular environment, such as the gut and **microbiota** to the actual microorganisms. However, these terms are often used interchangeably, even by experts. The term **gut flora** is an older term which refers to members of the Plant Kingdom and is now regarded as inaccurate as it does not encompass all of the microorganisms that are in the gut.

Is it normal to have bacteria in the gut?

Absolutely. Bacteria are found all along the GI tract from the mouth to the anus. While the largest numbers and greatest range of bacteria are found in the colon, bacteria are also normally found in the esophagus, stomach and small intestine, albeit in smaller numbers.

What makes up the gut microbiome?

The normal gut microbiome contains trillions of bacteria from many species and strains and also normally contains viruses, fungi and other micro-organisms. In there are two main groupings of bacteria, Firmicutes and Bacteroidetes – most of our normal bacteria belong to one of these two groups.

What do they do?

- ▶ So extensive are the functions of normal microbiome that some have referred to the gut microbiome as the “forgotten or ignored organ.” Some of these functions include:
 - Crowding out pathogens
 - Promoting the development of the immune system
 - Strengthening the gut barrier (mucus, anti-bacterial molecules, etc.)
 - Metabolizing parts of the diet that we cannot digest (such as fiber) and producing molecules, such as short-chain fatty acids, that are important for health
 - Metabolizing drugs so that their active components are released
 - Producing chemicals that can interact with the nerves and muscles in the gut wall
 - Communicating with the nervous system to promote its development and function (the microbiota-gut-brain axis)

What is the difference between “good” and “bad” bacteria?

There are some clear-cut examples of this difference such as the contrast between good bacteria such as Lactobacilli and a pathogen (a bacterium that causes disease or injury) such as Vibrio cholerae. In other circumstances a bacterium that is present in the gut and doing no harm can become a pathogen when the hosts defenses are impaired.

What happens when my gut bacteria populations are disrupted?

A very good example of this is provided by what can happen with *Clostridioides difficile* (formerly referred to as *Clostridium difficile*) infection. When a broad-spectrum antibiotic suppresses members of the normal microbiome the door is left open for *C difficile* to enter and proliferate and cause diarrhea and colitis.

When should I take an antibiotic?

- ▶ Listing all of the indications for an antibiotic is way beyond the scope of this FAQ but we would suggest that before prescribing and/or taking an antibiotic, the following questions should be addressed?
 - Will the antibiotic treat the problem? Example, antibiotics are often prescribed for illness (such as colds and sore throats) that are commonly caused by viruses which will be unaffected by an antibiotic.
 - Is it the best antibiotic for the infection that is being treated? Being aware of resistance patterns in your community is very important in this respect.
 - Will the antibiotic disturb or suppress the normal microbiome and should steps be taken to prevent or minimize this?
 - Will the use of the antibiotic contribute to the development of antibiotic resistance?

Should I have my microbiome tested? Will the test tell me how healthy I am?

No. While changes in the microbiome have been lined to various diseases and the microbiome may predict the response to various treatments we are not yet at a stage where knowing your microbiome is of value in preserving your health or predicting your risk of disease. We still have some way to go in understanding what is truly normal.

What are prebiotics, probiotics, synbiotics?

▶ A **prebiotic** is a substance, typically a carbohydrate, that is digested by our gut bacteria that promotes the growth of “good” bacteria and, thus, our health. Many fibers are prebiotics; food with prebiotic effects include onions, garlic, bananas and chicory. Other examples of prebiotics are inulin, the oligosaccharides in human breast milk and fructo-oligosaccharides that are present in many plants.

A **probiotic** is commonly defined as “a live microorganism that when consumed in adequate amounts confers a health benefit to the host.” Examples of probiotics include some Lactobacilli and Bifidobacteria and the yeast Saccharomyces.

A **synbiotic** is a product that contains a prebiotic and a probiotic.

How can I eat better for my microbiome?

▶ Diet is one of the major factors that shapes our microbiome and its influence is seen from infancy (breast or bottle-fed) to old age. All components of the diet influence the microbiome but in simple terms a diverse diet is good and fruits, vegetables and fiber are good in promoting a diverse and healthy microbiome. For these reasons, vegetarians may have a very different microbiome from meat eaters.

Should I take a probiotic every day?

▶ There is limited evidence that adding a probiotic to an otherwise healthy diet will “boost” your health or prevent disease. If you are healthy and eating a healthy and varied diet you probably do not need a probiotic as well; future studies may shed more light on this issue.

What is involved in fecal microbiota transplantation and when is it useful?

▶ Fecal microbiota transplantation (or transfer) (FMT) involves instilling a sample of stool (appropriately screened and prepared and suspended in water or saline) into the intestine of an individual to treat a disease. It can be paced into the colon by colonoscopy or as an enema, can be instilled into the upper small intestine via a naso-duodenal tube or ingested in capsules.

What is SIBO (small intestinal bacterial overgrowth)?

▶ Small intestinal bacterial overgrowth refers to the situation where there is an abnormally high number of bacteria or a change in the bacterial composition of the bacterial population in the small intestine such that it interferes with gut function and results in symptoms such as diarrhea.

Is gut microbiota different in rural people from urban people?

▶ There is evidence that suggests that people in rural areas of the world have more diverse gut microbiota, which could contribute to better health status than for those in urban areas. This might be explained by differences in diet but other factors may also contribute.

Apart from antibiotics, can other medications change the composition and function of the microbiome?

▶ We know that gut bacteria are involved in breaking down drug molecules – in some cases making them active, in other instances rendering them inactive; it would not be surprising, therefore, if drugs could influence microbiota. For example, any medication that reduces stomach acid production alters the movement of contents (motility) through the stomach and intestines or impacts on gut defenses, could change the composition or function of the bacteria in the gut. To what extent this occurs and what it means for our health is still being researched.

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World Gastroenterology Organisation (WGO)

555 East Wells Street, Suite 1100

Milwaukee, WI 53202 USA

Tel: +1 (414) 918-9798 • Fax: +1 (414) 276-3349

Email: info@worldgastroenterology.org

Web: www.worldgastroenterology.org

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@WorldGastroOrg



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