

Healthy Gut

Prebiotics and Probiotics

PHYSICIANS COMMITTEE FOR RESPONSIBLE MEDICINE

5100 WISCONSIN AVE., N.W., SUITE 400 • WASHINGTON, DC 20016
PHONE 202-686-2210 • FAX 202-686-2216 • WWW.PHYSICIANS COMMITTEE.ORG

Trillions of bacteria called microbiota live in the human gastrointestinal tract and play an important role in health. Nutrition helps shape the composition and metabolic activity of these bacteria. A plant-based eating pattern can improve health and prevent disease by influencing the microbiota.^{1,2}

Important Functions of the Microbiota

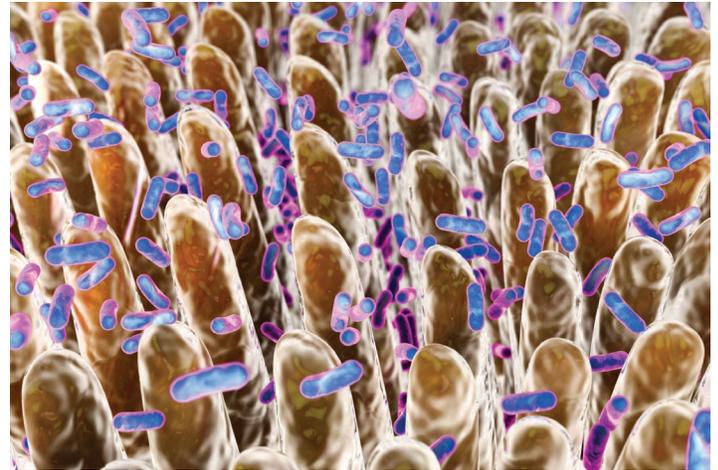
There are thousands of species of gut microbes that live in the gut—some healthy (symbionts) and some unhealthy (pathogens). Symbionts aid digestion and absorption of nutrients, synthesize certain vitamins and amino acids, and improve immune function. They also keep the pathogens in check by crowding them out or secreting substances that reduce their numbers.³ Since dietary fiber is not digested in the small intestines, when it makes its way to the large intestines, the healthy bacteria breaks it down releasing short chain fatty acids (SCFA). These SCFA improve the strength of the mucosal lining of the intestine that eases essential mineral absorption, improves fat metabolism for weight control, and reduces type 2 diabetes risk.¹ Research shows that SCFA reduce inflammation, a common cause for many chronic diseases.⁴

Microbiota Influences Your Health

Research suggests that people with a higher number of genes in their bacteria consume more fruits, vegetables, and whole grains.² Human studies associate a higher bacterial gene count with lower body weight, a lower risk of diabetes, less inflammation, and a healthier immune system when compared to those with lower bacterial gene counts who consume more fat and meat.^{2,5} Those individuals increase their risk for obesity, insulin resistance, and high cholesterol.^{2,5} High-fat, high-meat diets promote certain groups of bacteria that increase inflammation in the body.^{2,6} These higher undesirable bacterial profiles lead to obesity, diabetes, cardiovascular disease, and autoimmune diseases when compared to bacteria profiles in healthy people. Bacteria in the gut first metabolize choline, found in meat, eggs, and dairy, into trimethylamine, which travels to the liver and is further metabolized into trimethylamine-N-oxide (TMAO). TMAO increases the risk of cardiovascular disease and may trigger non-alcoholic fatty liver disease.⁷

Diet Quality Makes a Difference

A healthful diet improves the health and genetic diversity of the microbiota, preventing and treating diseases like obesity, diabetes, heart disease, and inflammation associated with autoimmune diseases.⁶ Some human studies demonstrate that a high-fiber, plant-



Bacteria on intestinal lining

based diet prevents inflammatory bowel disease and colon cancer.^{8,9} In other studies, consumption of animal protein activates bacterial enzymes that produce toxic metabolites that trigger inflammation and increase the proliferation of undesirable pathogens.⁶ A total vegetarian diet elicits the growth of known healthy bacteria while helping with weight loss, blood pressure control, and reversing diabetes.¹⁰

Lifestyle Guidelines for a Healthy Microbiota

- 1. Focus on Fiber.** Build meals around healthful plant-based foods: Vegetables, fruits, whole grains, and legumes improve the health of the microbiota. These high-fiber foods feed the healthy bacteria that produce SCFA and other metabolites that improve immune function and nutritional status, reduce inflammation and chronic disease, and even regulate mood and behavior. Aim to consume at least 40 grams of fiber each day. Some experts recommend up to 50 to 55 grams per day. Historic populations consumed nearly three to four times as much fiber as we do today. The average American currently consumes 16 grams of fiber. Adding 14 grams of fiber a day can reduce calorie intake by 10 percent.
- 2. Prebiotics.** Prebiotics are dietary fiber that enhance the growth of healthy bacteria and provide health benefits to the human host. Try to consume at least 5 to 8 grams of plant-based prebiotics each day. This is easy to accomplish with two cups of leafy greens or a half-cup serving of beans. Good



sources include Jerusalem artichokes, chicory root, raw dandelion greens, leeks, onions, garlic, asparagus, whole wheat, spinach, beans, bananas, oats, and soybeans.



3. **Probiotics.** Probiotics are live bacteria or yeasts found in fermented foods or supplements that, when consumed, take residence in the gut and improve health. Scientists continue to research the mechanisms behind the benefits of probiotics. Consult your health care provider to determine which probiotic is good for you, but adding small amounts of fermented foods to your diet presents may help the growth and proliferation of healthy bacteria. Dietary sources include sauerkraut, miso, tempeh, soy sauce, and water kefir.



4. **Foods to Avoid.** Red meat, high-fat dairy products, fried foods, food additives, and advanced glycation end products (AGEs) all reduce the growth of healthy bacteria and enhance the growth of undesirable species linked to chronic disease. AGEs include proteins and fats exposed to high heat, such as sausage links, and sugar molecules found in candy bars.



5. **Fats.** Limit fat intake, especially if you have or are at risk for type 2 diabetes. Instead, opt for healthful sources, including an ounce of nuts or seeds or a small amount of avocado.



6. **Antibiotic Use.** Some scientists believe that overuse of antibiotics resulted in a loss of healthy bacteria and genetic diversity of the human microbiome. Environmental exposure to antibiotics also plays a role, as the Food and Drug Administration estimates that 80 percent of antibiotics are used in animal agriculture.¹¹ The best way to keep your gut healthy is to avoid excessive antibiotic use. There are times when it is necessary, but should be discussed with a health care provider. Avoiding animal products also reduces exposure to antimicrobial agents.



7. **Other Lifestyle Factors.** Evidence suggests that exercising, getting enough sleep, and avoiding or managing stress will also have a positive impact on the health of the microbiota.^{12,13}



Terminology

- **Microbiota** refers to a group of bacteria living in a specific environment such as the gut, skin, or another part of the body.⁷
- **Microbiome** is the collective genomic content of the microbiota or the genetic capacity of a specific environment.⁷
- **Prebiotics** are nondigestible carbohydrates that stimulate the growth and activity of healthy bacteria species in the large intestines.
- **Probiotics** are live microorganisms present in fermented food or supplements and offer health benefits to the human host.

References

1. Conlon MA, Bird AR. The impact of diet and lifestyle on gut microbiota and human health. *Nutrients*. 2015;7:17-44.
2. Jeffery IB, O'Toole PW. Diet-microbiota interactions and their implications for healthy living. *Nutrients*. 2013;5:234-252.
3. Requena T, Cotter P, Shahar DR, et al. Interactions between gut microbiota, food and the obese host. *Trends Food Sci Technol*. 2013;34:44-53.
4. Vinolo MA, Rodrigues HG, Nachbar RT, Curi R. Regulation of inflammation by short chain fatty acids. *Nutrients*. 2011;3:858-876.
5. Le Chatelier E, Nielsen T, Qin J, et al. Richness of the human gut microbiome correlates with metabolic markers. *Nature*. 2013;500:541-546.
6. Brown K, DeCoffe D, Molcan E, Gibson DL. Diet-induced dysbiosis of the intestinal microbiota and the effects on immunity and disease. *Nutrients*. 2012;4:1095-1119.
7. Tramaroli V, Bäckhed F. Functional interactions between the gut microbiota and host metabolism. *Nature*. 2012;489:242-249.
8. DeFilippo C, Cavalieri D, Di Paola M, et al. Impact of diet in shaping gut microbiota revealed by a comparative study in children from Europe and rural Africa. *Proc Natl Sci USA*. 2010;107:14691-14696.
9. O'Keefe SJ, Li JV, Lahti L, et al. Fat, fiber and cancer risk in African Americans and rural Africans. *Nat Commun*. 2015;6:6342.
10. Kim MS, Hwang SS, Park EJ, Bae JW. Strict vegetarian diet improves the risk factors associated with metabolic diseases by modulating gut microbiota and reducing intestinal inflammation. *Environ Microbiol Rep*. 2013;5:765-775.
11. Riley LW, Raphael E, Faerstein E. Obesity in the United States - dysbiosis from exposure to low-dose antibiotics? *Front Public Health*. 2013;1:169.
12. Rosselot AE, Hong CI, Moore SR. Rhythm and bugs: circadian clocks, gut microbiota, and enteric infections. *Curr Opin Gastroenterol*. 2016;32:7-11.
13. Cronin O, Molloy MG, Shanahan F. Exercise, fitness, and the gut. *Curr Opin Gastroenterol*. 2016;32:67-73.

PHOTOS: THINKSTOCK