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The Gut Microbiome

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What is it?

- System of bacteria, fungi, and viruses that live in the gut, unique to each person [1]
- Affected by diet, age, pollution, and genetics [1,2]

"The human gut biome harbors genes that the human genome does not have. These genes encode enzymes, proteins, and many kinds of molecules that allow bacteria to do things that humans cannot do." [3]

Normal vs Abnormal

- Normal: Diversity and richness of microbes
- Abnormal: Overgrowth or undergrowth of particular microbes (gut dysbiosis)

Diseases associated with gut dysbiosis

- Hypertension [4]
- IBD [1]
- Atherosclerosis [4]
- Type 2 Diabetes [5]

The human body contains 0.2 kg of bacteria! [7]

Nutrigenomic Factors

- L reuteri bacteria have the gene that encodes the bile salt hydrolase enzyme [3]
- Genetically influenced shift in gut microbiome toward increased production of butyrate has beneficial effects on pancreatic beta-cell function [5]
- Prolonged antibiotic usage is linked to fungal infection and overgrowth in the gut [1]
- Breastfeeding introduces early-life microbiota exposure and can increase gut biome diversity [2]
- Certain genetic elements from the intestinal microbiota may complement the genes required for biological pathways in the human intestine. Ex. polysaccharide metabolism, methanogenic pathways for hydrogen gas removal, and enzymes for detoxification of xenobiotics [6]

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How to improve the function of your biome

- Mediterranean diet [9]
  - Increases levels of fiber degrading flora, and genes that degrade microbial carbohydrates
- Increase and diversify your fiber intake [10]
- Eat more fermented foods [11]
- Eat more pro and pre biotics [12]
- Have adequate intake of vitamins A, D, and E as well as calcium and magnesium [9]

Probiotics vs Prebiotics

Probiotics - live micro-organisms that, when administered in adequate amounts, confer a health benefit on the host

Prebiotics - selectively fermentable ingredients that allow specific changes in the composition and/or activity of GI microbiota that allow benefits to the host

Synbiotics - a combination of a probiotic micro-organism with a prebiotic fiber [8]

Individuals with gut dysbiosis may be at a higher risk for increased COVID-19 hospitalizations and mortality [9]

Examples for Nutrition

Fermented Foods

- Kombucha, sauerkraut, sourdough bread, kimchi

Prebiotics

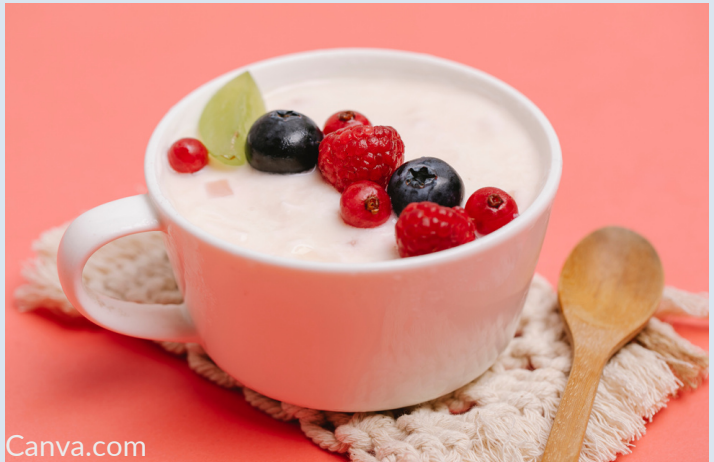
- Legumes, whole grains, fruits and vegetables

Probiotics

- Dietary supplements

A Healthy Gut Biome Can:

- Boost immune health
- Enhance nutrient absorption
- Benefit brain health



For More Information:

Harvard T.H. Chan School of Public Health, The Microbiome: https://www.hsph.harvard.edu/nutritionsource/microbiome/

Cleveland Clinic, How to Pick the Best Probiotic for You: https://health.clevelandclinic.org/how-to-pick-the-best-probiotic-for-you/

The National Center for Complementary and Integrative Health, Probiotics: What You Need to Know: https://www.nccih.nih.gov/health/probiotics-what-you-need-to-know

References

1. Vemuri R, Shankar EM, Chieppa M, Eri R, Kavanagh K. Beyond just bacteria: Functional biomes in the gut ecosystem including Virome, Mycobiome, Archaeome and helminths. Microorganisms. 2020;8(4):483. doi:10.3390/microorganisms8040483
2. Chen J, He X, Huang J. Diet Effects in Gut Microbiome and Obesity. *Journal of food science*. 2014; 79: R442-R451.
3. Gustafson C. Kelly C. heim, PhD: Effects of the gut microbiome on cardiovascular health. Altern Ther Health Med. 2014;20:62-4. https://proxy.consortiumlibrary.org/login?url=https://www.proquest.com/scholarly-journals/kelly-c-heim-phd-effects-gut-microbiome-on/docview/1524247714/se-2?accountid=14473.
4. Li J, Zhao F, Wang Y, et al. Gut microbiota dysbiosis contributes to the development of hypertension. Microbiome. 2017;5(1). doi:10.1186/s40168-016-0222-x
5. Sanna S, van Zuydam NR, Mahajan A, et al. Causal relationships among the gut microbiome, short-chain fatty acids and metabolic diseases. Nature Genetics. 2019;51(4):600-605. doi:10.1038/s41588-019-0350-x
6. Hemarajata P, Versalovic J. Effects of probiotics on gut microbiota: Mechanisms of intestinal immunomodulation and neuromodulation. Therapeutic Advances in Gastroenterology. 2012;6(1):39-51. doi:10.1177/1756283x12459294
7. Sender R, Fuchs S, Milo R. Revised Estimates for the Number of Human and Bacteria Cells in the Body. PLoS Biol. 2016;14(8):e1002533. Published 2016 Aug 19. doi:10.1371/journal.pbio.1002533
8. National Center for Complementary and Integrated Health. July 2019. Probiotics: What you need to know. Retrieved from: https://www.nccih.nih.gov/health/probiotics-what-you-need-to-know
9. Hoefer CC, Hollon LK, Campbell JA. The role of the human gutome on chronic disease. Advances in Molecular Pathology. 2021;4:103-116. doi:10.1016/j.yamp.2021.06.003
10. Ma W, Nguyen LH, Song M, et al. Dietary fiber intake, the gut microbiome, and chronic systemic inflammation in a cohort of adult men. Genome Medicine. 2021;13(1). doi:10.1186/s13073-021-00921-y
11. Leeuwendaal NK, Stanton C, O'Toole PW, Beresford TP. Fermented foods, health and the gut microbiome. Nutrients. 2022;14(7):1527. doi:10.3390/nu14071527
12. Enam F, Mansell TJ. Prebiotics: Tools to manipulate the gut microbiome and metabolome. Journal of Industrial Microbiology and Biotechnology. 2019;46(9-10):1445-1459. doi:10.1007/s10295-019-02203-4