THE GUT-BRAIN CONNECTION

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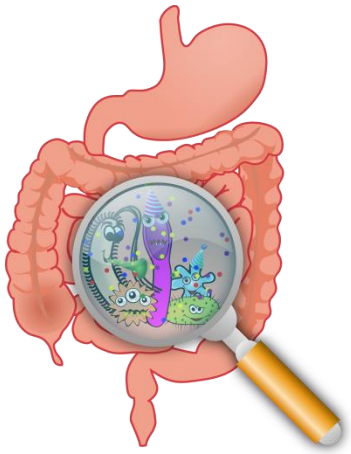
How are the microbes in your gut and your brain connected?

- What in the world are microbes doing in my gut?
  - All of us have trillions of microorganisms (bacteria, viruses, protozoa and fungi) that live, for the most part, in harmony with us in our **gastrointestinal tract** (*the long tube that runs from our mouth to our anus*). Most of these microbes live inside our bodies but do not make us sick. In fact, they play an important role in our health. They help us to digest our food, protect us from harmful bacteria that cause disease, produce vitamins, and regulate our immune system. These microbes and their DNA are collectively referred to as the **gut microbiome**.



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- What is the connection between the microbiome and the brain?
  - Our brain and gut are connected by a network of **nerve cells** and a highway of **chemicals and hormones**. This connection is called the gut-brain axis. Information is constantly shared between the brain and the gut about how hungry you are, your stress level, whether you have ingested harmful bacteria, and much more. The microbes in the gut can also release chemicals that have a role in inflammation and impact our mood. In this way, the microbes in our gut, the local nervous system of the gut, and our brain share a lot of information.

Do changes in the microbiome affect our health?

- What can go wrong in this system?
  - The microbes in our gut live in a fine balance. We need a mixture of good microbes to carry out different functions. When this balance is disrupted, it is called **dysbiosis.** Dysbiosis can have negative effects on our health. Some things that can lead to dysbiosis are antibiotic use, consumption of alcohol and certain diseases.

- Do women with pelvic pain have changes in their gut microbiomes? Can these changes influence pain?
    - Women with pelvic pain have different types and numbers of microbes that inhabit their digestive tracts than healthy adults. Studies have evaluated women with vulvodynia and endometriosis. Low levels of some of the more beneficial bacteria and high levels of some of the more harmful bacteria have been observed. This tells us that there may be a relationship between painful conditions and the gut microbiome, but further research is needed to tell us if these changes *cause* pain. Right now, there is a small group of studies in animals suggesting that changes in the microbiome may lead to changes in the sensation of **visceral pain** (*pain related to an organ, such as the uterus and the bladder*).

What can I do to optimize my nutrition and promote a healthy gut?

- What is the best diet for my health and microbiome?
    - There is no one diet that is perfect for everyone and there are many healthful ways of eating across cultures and food preferences. There are, however, a few important principles to keep in mind.
    - Emphasize plants. This helps feed the good bacteria in our gut. This means eating 8-10 servings of vegetables per day.
    - Consume foods with fiber. Foods with fiber help the good bacteria to multiply in our gut. Some examples of these foods are asparagus, bananas, garlic, onions, and whole grains.
    - Minimize added sugars. Examples of foods with added sugar are sodas, desserts, and even ketchup. It is important to read food labels. Consuming large amounts of sugar or artificial sweetener can lead to gut dysbiosis.

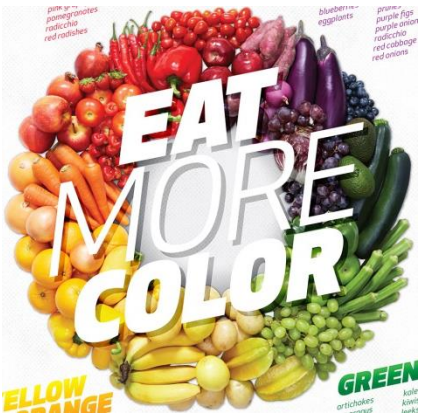

Image Credit: American Heart Association

    - Eat the rainbow. Plants derive their colors from phytochemicals found within them. The color of a fruit or vegetable can help tell you what types of nutrients it contains. Eating foods of different colors allows you to easily access all the vitamins and minerals you need.

- What are other ways to promote a healthy microbiome and good digestion?
    - Regular physical **exercise** can assist with **gut motility** (*the efficiency with which your food moves through your body),* prevent constipation, promote a healthy weight, and decrease stress. The Physical Activity Guidelines for Americans suggest at least 150 minutes of moderate intensity activity and 2 sessions of strength training per week.

- Stress can cause changes in the makeup of your gut microbiome. Lowering your stress through exercise and **mindfulness meditation** may help restore the health of your microbiome and promote your overall well-being.

Additional References:

Carabotti, Marilia, et al. "The Gut-Brain Axis: Interactions between Enteric Microbiota, Central and Enteric Nervous Systems." *Annals of Gastroenterology*, Hellenic Society of Gastroenterology, 2015, www.ncbi.nlm.nih.gov/pmc/articles/PMC4367209/.

Carding, Simon, et al. "Dysbiosis of the Gut Microbiota in Disease." *Microbial Ecology in Health and Disease*, Co-Action Publishing, 2 Feb. 2015, www.ncbi.nlm.nih.gov/pmc/articles/PMC4315779/.

Chichlowski, Maciej, and Colin Rudolph. "Visceral Pain and Gastrointestinal Microbiome." *Journal of Neurogastroenterology and Motility*, vol. 21, no. 2, 2015, pp. 172–181, https://doi.org/10.5056/jnm15025.

Conlon, Michael A, and Anthony R Bird. "The Impact of Diet and Lifestyle on Gut Microbiota and Human Health." *Nutrients*, MDPI, 24 Dec. 2014, www.ncbi.nlm.nih.gov/pmc/articles/PMC4303825/#B48-nutrients-07-00017.

Hair, Marilyn, and John Sharpe. *Fast Facts About The Human Microbiome*. The Center for Ecogenetics and Environmental Health, University of Washington, 2014, depts.washington.edu/ceeh/downloads/FF_Microbiome.pdf.

"Physical Activity Guidelines for Americans." *HHS.gov*, US Department of Health and Human Services, 1 Feb. 2019, www.hhs.gov/fitness/be-active/physical-activity-guidelines-for-americans/index.html.