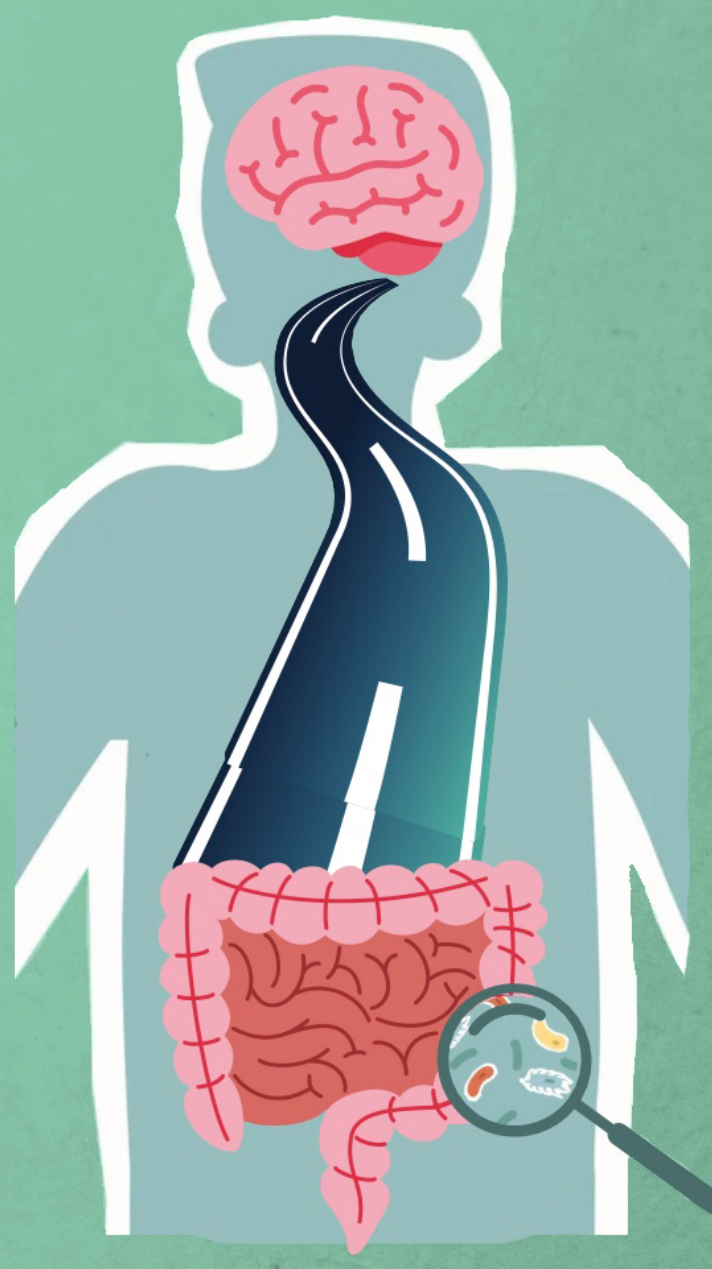
Gut Microbiome and Anxiety

Your gut microbiome - located largely in the colon - is a collection of trillions of microorganisms (mostly tiny bacterial cells) that play an integral in your health and are involved in many important functions, including mental health and immunity.

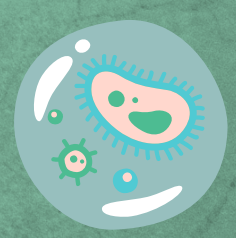
The Gut-Brain Highway



- In 2003, a study by Sudo et. al proposed the existence of the gut-brain axis through the discovery of impaired stress response in germ-free mice.
- Other similar studies support both the existence of GBA and how it may extend beyond these 2 systems into the endocrine, neural, and immune pathways.
- Your gut health is closely related to your nervous system functions. Hormones, neurotransmitters, and immunological factors from the gut can all send messages to the brain.
- It is thought that there is a bi-directional communication between the central nervous system and the gut microbiota, where the gut microbiome regulates brain function through the GBA/hypothalamic-pituitary- adrenal (HPA) axis, and vice versa.
- Specifically, the vagus nerve highway in the GBA allows communication between the brain and the gut, where the nerve fibers are connected to cells in the gut lining.

How does the GBA relate to anxiety?

- The diverse gut microbiome produces an array of compounds that can affect your mind and emotional health both positively and negatively.
  - Bacteria in Clostridium genus generate propionic acid - reduce the body's production of dopamine and serotonin
  - Bacteria Bifidobacteria enhance production of butyrate - an anti-inflammatory substance that deters toxins from getting into the brain
  - Others produce tryptophan - a precursor to serotonin
- Dysbiosis (a lack of diverse species or an imbalance between microbes in the gut):
  - Can be caused by ingesting foods containing antibiotics, artificial sweeteners, pesticides & GMOs
  - Can exert a powerful influence on the brain and activate the body's biological stress response via the gut-brain axis in ways that may cause anxiety
  - disturbances in neurotransmitters (eg. dopamine & serotonin) might cause symptoms of anxiety
- How stress can perpetuate:
  - The vagus nerve can be inhibited by stress and thus unable to control the permeability of the gut lining. The gut lining stays porous and can allow some metabolites, toxins, and bacteria to pass through the blood-brain barrier (which is suppose to protect the brain from infection)
  - Through the vagus nerve, the metabolites & etc produced by microbes may reach the brain where they can modify mood and anxiety levels.



The Future of Mental Health Treatment & Probiotics

- Research points to interventions that may help regulate gut microbiota, such as gut-friendly dietary changes & taking probiotics, may be able to reduce anxiety.
- Under experimentation: Novel psychobiotics are probiotics that may provide mental health benefits to the human body when ingested in a particular quantity through interaction with the gut microbiome.
- Current research doesn't completely elucidate the gut-anxiety connection as most research is preclinical studies.
- Larger and clinical future studies are needed to confirm these early findings.

RESEARCH SUMMARY BY LISA WANG
INFOGRAPHIC DESIGN AND FORMAT BY LISA WANG IN CANVA

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The Vagus Project
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