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Depression in Macrobiota and Microbiota

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Description

An intriguing topic that has captured the interest of many scientists is the mind-gut interaction. Ongoing studies show that microbiome residing within the gastrointestinal tract seem to be interwoven with our mental health through its ability to modify behavioral and cognitive brain activities. Gut microbiome is present from early stages of life, but continues to be affected by genetics as well as epigenetics as we grow. Upon disturbance, the microbiome can pertain to different chronic illnesses ranging from type 2 diabetes to Alzheimer's disease and depression. Certain intestinal bacterial strains are found to be either depleted or augmented in depressed individuals. Evidence based studies demonstrating bacterial phyla correlated with depression will be explored in this paper. In addition, recent therapeutic implications are going to be discussed as there are several treatments present.

Depression is a major cause of global disease burden leading to health complications and in some cases to suicide. Over 300 million people in the world suffer from depression, making 4.4% of the world's total population. According to the World Health Organization (WHO), the U.S. is considered one of the most depressed countries worldwide. For decades many factors were believed to contribute to depression and the main one was chemical imbalance, but the truth is depression is much more complex than that. In fact, living microscopic agents are proposed to intervene with humans' mental state and behavior. These agents are gut microbes.

Surprisingly, the gut microbiota contains 150 times more genes than the whole human genome. The first study documenting the ability of gut bacteria to impact behavior was demonstrated in a series of studies using *Campylobacter jejuni* pathogen in mice. The pivotal relationship existing between mental health status and microbes of the gastrointestinal (GI) tract has been bolstered by remarkable new studies. The GI tract is a neural, endocrine, immune organ that harbors microbes interacting with the brain through the gut-brain axis. This interaction is bidirectional and ensures a proper functioning and well-being of the body via various biological pathways, exemplified by enteric nervous system. Microbes in the body maintain a dynamic gut-brain interaction through synthesizing neuroactive molecules such as histamine, catecholamines, and other substances which affect host neurophysiology.

Microbial profile in depression

Extensive research on both mice and humans showed that distinct microbial compositions are associated with clinical depression. According to a fecal microbiota transplant (FMT) from depressed individuals and controls to microbiota-deficient mice, depression is accompanied with a narrowed diversity of microbiome. A study by Jiang et al. collected fecal samples from major depressive disorder (MDD) patients and healthy controls in order to be compared. After measuring microbial gut content, results showed a noticeable increase in *Actinobacteria*, Bacteroidetes, Proteobacteria phylum while a decrease in Firmicutes phylum in the MDD group compared to the healthy one. Moreover, *Bifidobacterium* and *Lactobacillus* which are GABA and lactic acid producers respectively were shown to be less abundant in individuals with MDD than controls [1-5].

Conclusion

Although the understanding of microbiota role in balancing brain and body health has developed rapidly, further investigation is warranted to reach causality between depression and intestinal flora. Therefore, resolving a chronic mental condition such as depression requires the implementation of larger clinical studies along with follow ups in order to design individualized treatment regimens and novel microbe-based formulations.

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