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Editorial Note Open Access

Microbes Could Effect Gut

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Editorial

In recent years, however, the field has made significant strides, O'Malley says. Rather than talking about the microbiome as a whole, some research teams have begun drilling down to identify specific microbes, mapping out the complex and sometimes surprising pathways that connect them to the brain. "That is what allows causal attributions to be made," she says. Studies in mice and preliminary work in humans-suggest that microbes can trigger or alter the course of conditions such as Parkinson's disease, autism spectrum disorder and more (see 'Possible pathways to the brain'). Therapies aimed at tweaking the microbiome could help to prevent or treat these diseases, an idea that some researchers and companies are already testing in human clinical trials.

Interaction of Microbes

1. Microbes interact with immune cells in the gut, prompting the cells to make cytokines that circulate from the blood to the brain.
2. Microbes interact with gut cells called enteroendocrine cells that produce neuroactive molecules and peptides. These molecules interact with the vagus nerve, which sends signals to the brain.
3. Microbes in the gut produce neurotransmitters and metabolites like butyrate. These circulate to the brain, where some of them are small enough to cross the blood-brain barrier, and others alter cell activity at the barrier itself.
4. In 2018 researchers at the University of Alabama at Birmingham reported at a meeting that they had found gut bacteria in human brain tissue.

The discovery of the gut microbiome has added a long overlooked component to the complex bidirectional signaling between mind, brain, gut, and its microbiome and surprisingly has triggered a tremendous interest by the professional and lay media, as well as by national funding agencies, including the National Institute of Mental Health. The initial skepticism about reports suggesting a profound role of an intact gut microbiota in shaping brain neurochemistry and emotional behavior has given way to an unprecedented paradigm shift in the conceptualization of many psychiatric and neurological diseases.

Although many of the new concepts are primarily based on the intriguing experimenta findings in rodents, initial studies in humans seem to support the notion that there is a relationship between the complex world of microbiota in our intestines and brain structure and function. Even though the majority of published studies of gut microbiome to brain signaling are based on microbiome analyses from stool samples, future studies will almost certainly expand the scope of investigations to mucosal samples taken from different regions of the gastrointestinal tract. Based on our current, still limited knowledge about these gut-microbiome-brain interactions, intriguing speculations have been proposed in a rapidly increasing number of review articles on the topic. They range from terms, such as "psychobiotic" or "melancholic" microbes to concepts that humans are just the vehicle for the 100 trillion microorganisms living inside of us.

The latter concept has been developed into the intriguing hypothesis that the gut microbiota have developed ways to "hack" into our reward system to make us crave certain foods and avoid others that are most beneficial to them. Similarly, microbe-brain interactions have been recently proposed to be a key driver of the evolution of the social brain. The following review addresses some aspects of the rapidly evolving topic of gut-microbiome-brain interactions in health and disease. Even though not a comprehensive review of the topic, it provides a glance into this emerging new view of neuroscience.

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Conflict of Interests

The authors declare that they have no conflict of interest.