

Insights into the ecology of the microbiome

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The microbiome is like a fingerprint: every person's community of microbes is complex and unique. But the underlying dynamics, the interactions between the microbes that shape these microbial ecosystems, may have something in common. To investigate, researchers from the Channing Division of Network Medicine at Brigham and Women's Hospital, led by Amir Bashan, PhD, and Yang-Yu Liu, PhD, analyzed data from large metagenomic datasets (e.g. the Human Microbiome Project and Student Microbiome Project) to look at the dynamics of the gut, mouth and skin microbiomes of healthy subjects.

The team found universal (host-independent) [dynamics](#) for both the gut and the mouth of healthy individuals. In people with recurrent *C. difficile* infections, these universal patterns broke down. However, after receiving a [fecal microbiota transplant](#) (FMT) to treat the infection, the same subjects showed universal gut microbial dynamics.

The new work helps to improve researchers' understanding of the processes that shape the microbiome and could inform future treatments of subjects with other diseases or infants at different developmental stages. The researchers note that their computational approach can also be used to analyze [microbial ecosystems](#) found in soil, ocean, lakes and more to detect universal dynamics of microbes in these environments as well. The research also sheds new light on why fecal microbiota transplantation may work so well, despite the uniqueness of each individual's microbiome.

"Fecal microbiota transplantation has been very successful for many

patients with *C. difficile* infections, but we've never known why. What we've found here - that different people share similar ecological networks - may help us understand why FMT works," corresponding author Yang-Yu Liu, of the Channing Division of Network Medicine at BWH. "Our work also suggests that we can design very generic microbiome-based therapies to treat patients. Because we share similar ecological networks, truly individualized or personalized therapies, which consider not only the unique microbial state of an individual but also the unique dynamics of the underlying microbial ecosystem, may not be needed in order to shape the healthy microbiome."

More information: Amir Bashan et al, Universality of human microbial dynamics, *Nature* (2016). [DOI: 10.1038/nature18301](https://doi.org/10.1038/nature18301)

Provided by Brigham and Women's Hospital

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