The University of Edinburgh - Friedrich Schiller University

Population Dynamics Virtual Seminar

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Is microbiota intervention feasible?
Investigations in in-vitro communities of nasal bacteria

Our associated microbiota impacts our health in several ways, from assisting food digestion to protecting us from pathogens. Given this impact, microbiota-based therapy—restructuring the microbiota—has been proposed as a strategy to maintain or restore health, especially in situations where antibiotics will not work. The main roadblock is that we still lack rational strategies to sway microbiota composition towards a desired state. Such strategies involve two steps: a reliable model capable of predicting microbiota dynamics and an intervention scheme that is feasible and effective. For most microbiota, the complexity burden—the presence of too many interacting species engaged in mostly uncharacterized interactions—puts this approach out of reach. To avoid this shortcoming, in-vitro communities of human nasal bacteria offer unique advantages. While tractable, these communities are not too distant from nature because human nasal microbiota often contains only a handful of dominant species that can be cultivated reliably in the lab. They are also clinically relevant, because nasal microbiota itself is an important component of our respiratory health.

Here, we first assess when simple models can predict community dynamics. We show that in low-nutrient (i.e., when growth is limited by the availability of nutrients) and complex (i.e., when multiple resources, rather than a few, are influential) environments, a simple model for community dynamics can be developed. We then set up stable communities using different subsets of a panel of eight bacterial isolates from human nasal passage. We use these stable communities in invasion assays and share some of our early results of invasion outcomes relevant to colonization resistance and engraftment. Collectively, insights from in-vitro nasal bacterial communities serve as a stepping stone towards rational control of more complex microbiota.

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