How does intermittent feeding shape the gut microbiome?

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Résumé

Feeding impacts the composition of the gut microbiome in animal hosts. While most research efforts have been directed towards studying the impact of the nutritional bolus on the microbiome composition, the effective use of probiotics suggests that, at least in some cases, the immigration of microbes through feeding to the gut community also has the potential to modify its composition. In community ecology, immigration is considered a key factor to maintain the diversity of a local community; furthermore, a diverse gut microbiome is usually considered an important determinant of health. Thus, questions arise: do hosts adapt their feeding behavior so as to manipulate microbial immigration in a way that facilitates the maintenance of a diverse flora? What fluctuations are to be expected in the community composition from feeding intermittence, and should sampling be controlled for it? We develop mathematical models of microbial communities with birth, death and intermittent migration to study these questions. So far, we have shown that intermediate feeding frequencies facilitate coexistence in a multi-species community, and that a food more concentrated in microbes relaxes the constraint around the optimal feeding frequency. We will compare our theoretical results with experimental studies in different animals, as we expect this effect to depend on host characteristics, like typical carrying capacity or transit time.

Mots-Clés: mathematical modelling, gut microbiome, feeding behavior, diversity

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