

Precision Probiotics and Prebiotics: Lessons from Ecology

Abstract

By capitalizing on inter-individual variation in person-specific factors relevant to health, precision medicine and personalized nutrition aim to generate data-driven personalized treatment regimens or dietary recommendations, respectively. The gut microbiome's importance in human health, its interactions with drugs and nutrients, and its vast inter-individual variability makes it an integral part of these disciplines and the application of pro- and prebiotics. In this presentation, I will provide an ecological perspective on precision pro- and prebiotic applications, and specifically discuss the drivers of microbiome variation and how an understanding of microbial interactions provides mechanistic explanations for the individualized effects of probiotics, prebiotics, and dietary fiber. I will discuss current limitations of this field, then provide future directions and propose avenues to improve microbiome modulating strategies and their precision through a consideration of ecological principles.

Outline

- Drivers of microbiome variation.
- Importance of ecological principles, and specifically microbial interactions to understand the effects of pro- and prebiotics on gut microbiota composition.
- Current state of evidence for **probiotic** personalisation
 - Persisters probiotic study – finding a functional microbiome niche – e.g. <https://pubmed.ncbi.nlm.nih.gov/27693307/>
 - New ISME publication on niches
- Current state of evidence for **prebiotic** personalisation
 - Differential response to prebiotics amongst individuals (RS2, RS4, arabinoxylan studies) – e.g. <https://pubmed.ncbi.nlm.nih.gov/21151493/>
 - Different profiles of effect of different prebiotic compounds – applicability to personalisation
 - Response prediction – new study arabinoxylan
- Potential mechanisms for probiotic and prebiotic non-responders (ecological)
- Vision of precision probiotics and prebiotics of the future, current limitations and future directions: Learning from ecology.
- Is there rational to design strategies to reduce inter-individual variation, if one uses ecological principles?