

# Population Dynamics Virtual Seminar



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28.05.21 - 3:30 pm GMT

## **Evolution of metabolic cooperation within microbial communities**

Cooperative interactions pose an evolutionary conundrum: why should one organism invest costly resources to benefit another individual and not use them to enhance its own fitness? Despite this problem, obligate interactions, in which two or more microorganisms exchange costly metabolites, are very common in natural microbial communities. However, the factors facilitating the evolution of metabolic cooperation remain poorly understood.

We address this issue experimentally by analysing genetically engineered and experimentally evolved cooperative cross-feeding interactions. Our experiments reveal that adaptive advantages drive the evolution of cooperative cross-feeding within microbial communities: by losing the ability to autonomously produce certain metabolites, bacteria become dependent on other community members producing these compounds. These metabolic interdependencies trigger a coevolutionary process, during which mutual cooperative investments rapidly increase.

In my talk, I will discuss the evolutionary drivers of this process and highlight the consequences of the resulting dynamics for both individual cells and physiologically interconnected consortia.

**Suggested Readings:** *Reciprocal Fitness Feedbacks Promote the Evolution of Mutualistic Cooperation* - Daniel Preussger, Samir Giri, Linéa K. Muhsal, Leonardo Oña, Christian Kost - *Current Biology* 2020 - <https://doi.org/10.1016/j.cub.2020.06.100>

*Ecology and evolution of metabolic cross-feeding interactions in bacteria* - Glen D'souza and Shraddha Shitut and Daniel Preussger and Ghada Yousif and S. Waschina and C. Kost - *Natural product reports* 2018 - <https://doi.org/10.1039/C8NP00009C>

*Bacterial Unculturability and the Formation of Intercellular Metabolic Networks* - Pande S, Kost C - *Trends Microbiol.* 2017 - <https://doi.org/10.1016/j.tim.2017.02.015>