Researchers propose mechanistic framework to explain complex microbe-host symbioses

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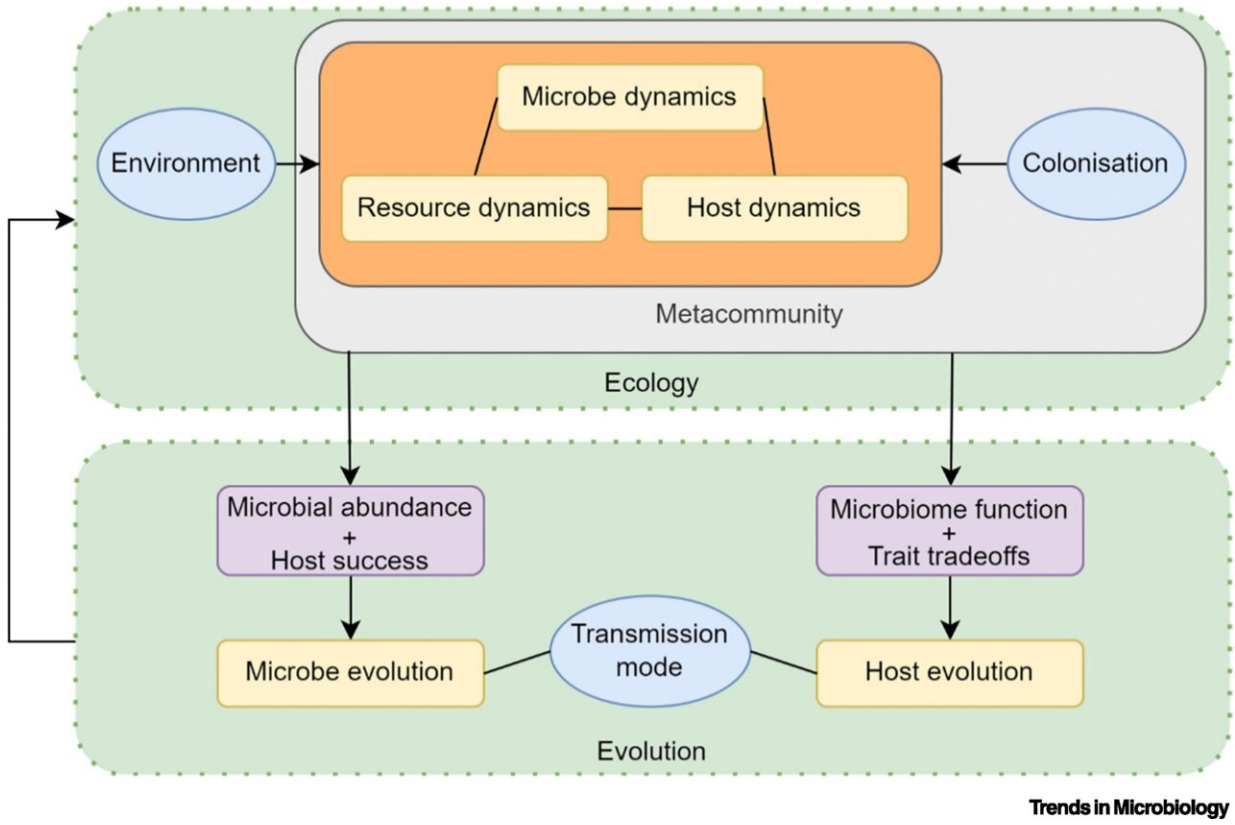

Conceptual framework incorporating the different components driving the assembly and composition of complex microbe–host symbioses. Credit: *Trends in Microbiology* (2024). DOI: 10.1016/j.tim.2024.08.002. https://www.sciencedirect.com/science/article/pii/S0966842X24002142

Virtually all multicellular organisms on Earth live in symbiotic

associations with very large and complex microbial communities known as microbiomes. New research has just been published aimed at offering a complete understanding how those relationships form.

Computational ecologist Dr Miguel Lurgi and colleagues explore how associations between complex bacterial communities and multicellular hosts emerge in nature by combining theory with empirical work. They are currently using the proposed framework to investigate microbes inside marine sponges.

The study is published in *Trends in Microbiology*.

Dr. Lurgi and his colleague, Dr. Gui Araujo, from the Biosciences Department of the Faculty of Science and Engineering, teamed up with collaborators from the French Scientific Research Council, the University of New South Wales in Australia, and the Institute for Marine and Antarctic Studies, also in Australia.

Dr. Lurgi said, "We argue that microbiome assembly is a product of ecology and evolution acting together.

"Our research aims at bringing together ecological and evolutionary theory on one hand, and microbial and symbiont ecology and evolution on the other, to create a holistic picture of the assembly of complex symbioses.

"These symbiotic relationships constitute one of the most ancient associations between multicellular organisms and groups of microbes, and, in many cases, they are fundamental to the persistence of both the host and the microbiome."

The researchers are currently using the proposed framework to investigate microbes inside marine sponges. They are also looking at

extending these findings to other microbiomes, eventually allowing for a unified understanding of the intricate nature of symbiotic relationships of multiple species within different groups of hosts and across taxa.

Dr. Lurgi said, "My main research focus is on the mechanisms behind the emergence of complexity in ecological networks. I develop theoretical models of ecological communities and network dynamics to better understand these mechanisms and the biodiversity patterns they give rise to."

Dr. Lurgi and Dr. Araujo are now working on developing the mathematical foundations of the ideas presented in the current paper and have just presented the work at the 19th International Symposium of Microbial Ecology (ISME 19), in South Africa, held August 18–23.

More information: Gui Araujo et al, A mechanistic framework for complex microbe-host symbioses, *Trends in Microbiology* (2024). DOI: 10.1016/j.tim.2024.08.002. www.sciencedirect.com/science/ … ii/S0966842X24002142

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