



RESEARCH TOPIC MEM25

Microbial-Driven Bile Acid Modifications and Their Impact on Gut Ecology MECM Data Science

Research Area

Immunology

Laboratory name

Microbial Ecology Lab

Research Supervisor

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Abstract

Bile acids (BAs) are central to digestion, cholesterol regulation, and host–microbe communication. Synthesized in the liver and released into the gut, host-produced BAs undergo a variety of microbial-driven modifications that diversify their chemical structures and biological functions. These alterations are sensed by the host, which in turn regulate BA production. When this cycle is disrupted, BA homeostasis can break down, leading to liver disease and metabolic disorders. Despite extensive research, we lack a full understanding of how and why bacteria collectively modify BAs.

This project focuses on two fundamental and complementary BA modifications: de-conjugation and the recently discovered re-conjugation of BAs with different amino acids.

Questions: Why are only some bacteria capable of performing one or both processes? Under which environmental conditions do organisms that can execute both modifications perform one over the other? How do these alterations influence community dynamics, particularly in the context of pathogen invasion?

This project focuses on combining theory with experiments to identify ecological principles in bacterial driven BAs modifications.

Main technical approaches

Mathematical modelling –microscopy and microfluidics – image analysis – data analysis – metabolomics.

Scientific references

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