

Invited talk

Precision approaches for decoding microbial physiology, interactions and chemical responses

26th November 2024

15.00-16.00 at building LY221 room R237



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Abstract

Microbiomes are essential to life, and effectively engineering their functions requires a deep understanding of the complex interactions among microbial members, their environment, and the chemical signals that coordinate their activities. In this presentation, I will introduce three innovative approaches to address this challenge. First, I will discuss the application of ultra-sensitive lipidomics combined with high-throughput microscopy to investigate how microbial interactions influence lipid degradation and, in turn, affect oceanic carbon budgets. Next, I will present microfabrication techniques that allow us to create custom abiotic environments around individual microbes, enabling precise measurements of how these environments and cell-to-cell heterogeneity shape population outcomes. Finally, I will introduce a novel method for assessing the effects of chemical signals on microbial metabolism. By integrating glass microfluidics, oxygen sensing, and a unique sliding mechanism, I will demonstrate how single-cell respiration in microalgae decreases in response to rising concentrations of a bacterial quorum molecule. By carefully combining these precision techniques, we can begin to quantify the interplay among environmental conditions, biological heterogeneity, and microbial chemical ecology, ultimately enhancing our ability to engineer the functional potential of microbiomes.

Bio

Dr. Lars Behrendt is an Associate Professor in the Department of Organismal Biology at Uppsala University, specializing in environmental toxicology. He has previously held postdoctoral positions at ETH Zürich and MIT, where he developed microfabrication techniques to investigate the interactions between microbes and their environments. To learn more about his work, visit <https://behrendtlab.com/>.