Session: Biofilm ecology and ecotoxicology

How *Pseudomonas aeruginosa* uses Type VI Secretion system to shape the structure of polymicrobial communities

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Pseudomonas aeruginosa is an opportunistic pathogen and its biofilm lifestyle is associated with chronic infections. To establish and persist within context of dense polymicrobial biofilm communities *P. aeruginosa* utilises Type VI Secretion system (T6SS) for direct competition. T6SS is a macromolecular weapon used to inject toxic effectors directly into adjacent prey cells. *P. aeruginosa* possesses 3 distinct T6SSs and a set of more than 20 toxic effectors. T6SS toxins poses a diverse set of functions including disruption of cell wall integrity causing lysis of competitors, degradation of nucleic acids and prey growth impairment via disruption of metabolism.

We generated a collection of mutants sensitive to individual T6SS toxins and lacking T6SS machinery aiming to investigate how *P. aeruginosa* gains a competitive edge in polymicrobial communities. By imaging whole mixed bacterial macrocolonies, it is possible to investigate how community structure is affected by action of individual T6SS toxins. Additionally, disruption of Gac-Rsm cascade, responsible for transition between planktonic and biofilm lifestyle and modulation of T6SS activity, results in both graduated elevation in T6SS expression and corresponding increase in T6SS dependent killing. Experimental work is supported by use of agent-based theoretical simulations that allow to connect how changes in T6SS firing behaviours at single cell scale lead to population level competitive advantages. Altogether this study furthers the understanding of how highly local contact-based interactions between individual bacteria shape structure of whole populations and how *P. aeruginosa* uses its substantial T6SS arsenal to successfully eliminate prey.