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Poster #52: Systematic studies of bacteriophage confinement in glycan-based biofilms of Erwinia amylovora

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Biofilms are a widespread microbial lifestyle in which cells are embedded in a self-produced extracellular polymeric substance (EPS) matrix composed of DNA, proteins, and glycans. In plant pathogens such as *Erwinia* spp., highly viscous, anionic polysaccharides dominate the EPS and act as effective diffusion barriers to bacteriophages, thereby influencing infection processes.
We investigated phage diffusion in glycan-based biofilms using tailed phages infecting *Erwinia* spp. In addition, polysaccharides from different *Erwinia* spp and *Pantoea* spp. biofilms were isolated, revealing pronounced biochemical diversity and variability in physical properties.
To quantitatively assess phage mobility, we tracked fluorescently labeled phages—representing both myoviruses and podoviruses—as well as similarly sized microspheres using single-particle tracking. Trajectory-based models identified distinct diffusion populations and enabled quantification of phage concentrations under diffusion-limited conditions across varying physicochemical environments. Notably, phage diffusion was strongly influenced by EPS concentration, pH, ionic strength, and phage-specific morphological properties, with myoviruses and podoviruses exhibiting distinct mobility patterns due to their distinct structural features and interaction dynamics with the biofilm matrix. Depolymerase-mediated degradation of biofilm polysaccharides proved to be a rapid and effective mechanism for modulating particle mobility, particularly enhancing the penetration of both phage types into dense biofilm regions. Furthermore, we link phage diffusion to host infection dynamics, revealing how myoviruses and podoviruses differentially navigate, penetrate, and infect bacterial hosts within dense, viscous biofilm environments—highlighting the importance of phage morphology in determining ecological success in complex microbial communities.
emphasized text

Reference #1

Dunsing V, Irmscher T, Barbirz S, Chiantia S. Purely Polysaccharide-Based Biofilm Matrix Provides Size-Sel

Reference #2

Reference #3

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