Contribution ID: **39** Type: **Poster only**

Poster #39: Novel insight into the infection and egress dynamics of an Inovirus in Shewanella oneidensis MR-1

Monday, 5 October 2026 20:54 (1 minute)

Inoviruses are widely occurring filamentous phages; the best-known members are the Ff phages, including F1, Fd, and M13, which have been studied extensively to investigate fundamental aspects of molecular biology. Outside the Ff group, however, knowledge of Inovirus infection and egress mechanisms remains scarce.
We recently isolated a novel phage, Shewanella phage Dolos, belonging to the family Inoviridae. We found that Dolos's infection and extrusion process does not follow the dogmatic regimen of Ff phages: Dolos binds to the type IV MSHA pilus filament as its primary recognition structure to attach and invade the cell. After Dolos reaches the cell surface via pilus retraction, the MSHA pilus detaches from the cell body, resulting in decreased biofilm formation. Additionally, all characterized phages of this type strictly require the TolA protein of the TolQRA system to enter the host cytoplasm. We found that Dolos infects in the absence of TolA, the first example of an Inovirus infecting independently of the TolQRA system. Initial experiments suggest that MshF, an MshA biogenesis protein and ortholog of PilN, is required for host entry. Inovirus egress, an extrusion across the host cell envelope, usually requires adhesion zones between the inner and outer membranes. While Ff phages encode all components necessary for egress, Dolos does not encode an outer membrane export protein; instead, it uses the same structure for exit as for entry, utilizing the host's MshL secretin for virion export. Thus, Dolos is a valuable model system challenging the paradigm of Inovirus biology.

Reference #1

Reference #2

Reference #3

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Session Classification: Poster-Session