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No Escape –The ARTs of host takeover

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Lytic phages and their bacterial hosts pursue fundamentally opposing strategies: while phages aim to maximize their replication and progeny production, bacterial hosts seek to restrict or prevent phage propagation. To counteract host defense systems and make optimal use of host resources, many phages encode dedicated effector proteins. Upon infection, *Shewanella* phage Thanatos directly injects two ADP-ribosyltransferases (ARTs), Alt1 and Alt2, into the host cell. We found that both are highly active and promiscuous enzymes that ADP-ribosylate more than 500 host proteins within minutes of infection before undergoing self-inactivation. Primary targets include the ribosome and RNA polymerase complexes, suggesting that these major cellular machineries are rapidly reprogrammed for subsequent phage production. In addition, several potential phage defense systems are targeted. While neither ART is essential for Thanatos infection, together they increase phage yield by approximately 10-fold. Notably, we found that the Thanatos ART effectors also suppress the emergence of host escape mutants. Thus, the Thanatos ARTs represent a novel class of phage effectors that promote both the immediate and long-term success of phage proliferation.

Reference #1

Reference #2

Reference #3

Author: Prof. THORMANN, Kai (Justus Liebig University Giessen)

Presenter: Prof. THORMANN, Kai (Justus Liebig University Giessen)

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