“Does P22 Bacteriophage Eject All Its Internal Proteins Before Its Genome?”

Bacteriophages are viruses that infect bacterial hosts. The genome of most phages is double-stranded (ds) DNA, leading to high pressures inside their protein shells (capsids). This pressure provides a large force driving ejection of the genome from its capsid. In Podoviridae, a type of dsDNA bacteriophage, there are several internal proteins contained in the capsid along with the DNA genome. These internal viral proteins are needed to facilitate successful passage of the viral DNA into the cytoplasm of the host cell. But essentially nothing is known about how and when the internal proteins come out of the virus. To study this question, and to progressively control the extent of ejection from P22, one of the Podoviridae, we set up an in vitro osmotic suppression system with high-molecular-weight polyethylene glycol (PEG) mimicking the cell environment. We find that 11 atm of osmotic pressure is sufficient to keep all of the DNA in the capsid, whereas the ejection of internal proteins is complete. This finding helps us understand how P22 infects its host cell and, in particular, about possible roles that the internal proteins play during infection.

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Thursday, December 11, 2014
12:00 P.M.
2033 Young Hall