

Understanding the mechanism of bacteriophage T7 DNA delivery system inside the bacterial cytoplasm

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The majority of bacteriophages protect their genetic material by packaging the nucleic acid in concentric layers to an almost crystalline concentration inside protein shells (capsid). This highly condensed genome also has to be efficiently injected into the host bacterium in a process named ejection. The assembly and maturation of bacteriophages take place through a series of concerted steps where macromolecular complexes play specific functions with high efficiency. Tailed phages represent an extreme case of optimization of the infective process. Bacteriophage T7 belongs to the *Podoviridae* family and has a short, non-contractile tail formed by a tubular structure surrounded by fibers. Besides the tail, T7 uses a second protein complex to puncture the *E. coli* bacterial membrane required for DNA ejection. This complex, named the “core”, is found inside of the viral head in the mature virus that it is postulated to be translocated through the tail during infection building a protein channel across the bacterial membrane. Correlation of the structural analysis of these complexes by cryo-EM with their biochemical and biophysical properties would allow to build a complete model for understanding the molecular mechanism of T7 DNA ejection process.