IN BRIEF

VIRAL INFECTION

ΦX174 crosses the border

Tailed phages transport their genomes into bacterial cells using their tail, whereas most tail-less phages use a host cell-encoded channel. One interesting exception is the icosahedral phage ΦX174, which is devoid of an external tail but instead uses the genome-associated DNA pilot protein H for DNA delivery. Sun *et al.* solved the crystal structure of protein H at 2.4 Å resolution and showed that its ten identical α-helical monomers are organized into a 170 Å-long α-barrel. This decameric coiled-coil contains transmembrane domains at each end, which may anchor the channel to the bacterial inner and outer cell membranes. The authors further found that H protein oligomerization is important for infectivity but not for particle formation. Using cryo-electon tomography, they went on to show that, following attachment of the ΦX174-like phage ST-1 to *Escherichia coli* mini cells, the virus extrudes a putative H tube for DNA transport across the periplasmic space. This tube is disassembled after DNA translocation.

ORIGINAL RESEARCH PAPER Sun, L. *et al.* Icosahedral bacteriophage ΦX174 forms a tail for DNA transport during infection. *Nature* http://dx.doi.org/10.1038/nature12816 (2013)

CELLULAR MICROBIOLOGY

Getting moving in the cytoplasm

In contrast to eukaryotes, bacteria lack cytoskeletal motor proteins and thus rely on diffusion for intracellular transport. The physical properties of the bacterial cytoplasm, which determine cytoplasmic dynamics and thus influence intracellular processes, are poorly understood. Using single-particle tracking of cellular components, such as poly-hydroxyalkanoate storage granules and crescentin filaments, as well as foreign particles, the authors show that the bacterial cytoplasm has similar characteristics to glass-forming liquids. After metabolic arrest, the motion of cytosolic components was drastically reduced. This metabolism-mediated effect did not involve motor-like activity or chromosome dynamics and was particle size-dependent, as increasing the size of the particle changed its mobility from fluid-like to glassy. Finally, active metabolism led to cytoplasmic fluidization, which enabled larger components to move within the cytoplasmic space. Thus, environmental signals that modulate bacterial metabolism may alter cytoplasmic fluidity and dynamics.

ORIGINAL RESEARCH PAPER Parry, B. R. *et al.* The bacterial cytoplasm has glass-like properties and is fluidized by metabolic activity. *Cell* http://dx.doi.org/10.1016/j.cell.2013.11.028 (2014)

BACTERIAL SECRETION

Caught in the act

The injectisome is the structural core of the membrane-embedded type III secretion system (T3SS), and bacterial effector proteins are secreted through this complex into the host. Radics *et al.* used cryo-electron tomography to visualize individual *Salmonella enterica* serovar Typhimurium T3SSs loaded with GFP-fused substrates that were transported into the injectisome but that subsequently became trapped and blocked the secretion of other substrates. Structural studies of substrate-trapped complexes showed that transport occurs in a polarized manner, with the amino-terminal domain of the substrate entering the complex first. Characterization of the secretion path within the injectisome suggested that T3SS effectors are transported in an unfolded state.

ORIGINAL RESEARCH PAPER Radics, J., Königsmaier, L. & Marlovits, T. C. Structure of a pathogenic type 3 secretion system in action. *Nature Struct. Mol. Biol.* http://dx.doi.org/10.1038/nsmb.2722 (2013)