

Function and Assembly of Type IV secretion systems

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Type IV secretion systems (T4SS) are encoded on numerous Gram negative bacteria genome and are ancestrally related to conjugation machines. These machines mediate transport of protein or DNA substrates to bacterial or eukaryotic cells through a process requiring direct cell-to-cell contact. The *Agrobacterium tumefaciens* VirB/D4 T4SS and related conjugation machines serve as models for detailed mechanistic studies aimed at elucidating the nature of translocation signals, machine assembly pathways and architectures, and the dynamics of substrate translocation. The *A. tumefaciens* VirB/D4 T4SS are polar-localized organelles composed of a secretion channel and an extracellular T-pilus. These T4SS are assembled from 11 or more subunits, whose membrane topologies, intersubunit contacts and, in some cases, 3-dimensional structures are known. We recently defined the subunit responsible for channel formation enabling substrate transport through the cell envelope. This mechanism is energized through the concerted action of three ATPases that control biogenesis and transport by regulating the conformation of a TonB-like subunit. These recent finding will be described and the current model for substrate translocation will be discussed.