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Structural perspectives on bacterial secretion machines

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For any cellular secretion mechanisms the key questions that need to be understood center on the processes that ensure how secretion is achieved without disruption of the membrane barrier, how the process is energized and how substrates are selected. We are pursuing structural studies of two very different bacterial secretion systems that take almost opposite approaches to this but where structures are beginning to give insight into mechanism. Recent work will be presented contrasting the Twin Arginine Transport (or Tat) system, a relatively simple 2 or 3 component system that manages to transport a wide range of fully-folded protein substrates, of very different size, shape and charge without promoting leakage from the cell with the Type Three Secretion System (or T3SS) a protein nano-machine constructed of more than 15 proteins that secretes fully unfolded substrates directly into a pathogen's host cells. Comparing the two systems yet again demonstrates how very different mechanisms and architectures can be used to achieve much more similar biological effects. The difficulties presented for structural studies of by these systems will also be highlighted as will the use of mixed structural methods to extend our understanding.

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