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| Title: | Taking Toll on Membranes: Curious Cases of Bacterial β-Barrel Pore-Forming Toxins |
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| Abstract: | A wide variety of bacterial pathogens secrete a unique class of proteins that attack target cell membranes and form transmembrane oligomeric pores with distinct β-barrel structural scaffolds. Owing to their specific mode of action and characteristic structural assembly, these proteins are termed as β-barrel pore-forming toxins (β-PFTs). The most obvious consequence of such pore-forming activity of bacterial β-PFTs is the permeabilization of cell membranes, which eventually leads to cell death. Bacterial β-PFTs have been studied extensively for nearly past four decades, and their mechanisms of actions have revealed some of the most enigmatic aspects of the protein structure–function paradigm. In most of the cases, β-PFTs are released by the bacteria as water-soluble monomeric precursors, which upon encountering target cell membranes assemble into membrane-inserted oligomeric pores. Structural descriptions are now documented for the water-soluble precursor forms, as well as for the membrane-anchored oligomeric pores of many β-PFTs. These studies have revealed that β-PFTs undergo a series of well-orchestrated structural rearrangements during membrane pore formation. Nevertheless, mechanisms that trigger and regulate distinct steps of the pore-formation processes still remain obscure. Here, we discuss our current understanding regarding structure–function mechanisms in the β-PFT family, with particular emphasis on some of the unsolved issues associated with the β-barrel pore-formation mechanism. |
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