

How to make pores in lipid bilayers by tuning shape of embedded objects

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Abstract

Membrane active peptides and proteins often undergo conformational changes while in contact with lipid membranes. Shape and size variation can be a key ingredient for membrane activity of certain peptides and proteins. Using Single Chain Mean Field (SCMF) theory we demonstrate that the pores in lipid bilayers can be opened and closed by tuning shape and size of the embedded hydrophobic object: (i) changing size and hydrophobicity of globular proteins may mechanically induce two kinds of pores around ion-channel in the equilibrium bilayer; (ii) by changing slightly the conformation of the protein the pore can be opened or closed with almost no energy cost. We also find that the protein can open and close the pore in the membrane by thermal fluctuations or by external stimuli.



Fig. Closed pore vs. open pore induced by fluctuations