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# Biomolecules in Contact with Lipid Bilayers: Basic Features of Membrane Activity

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## Extended Abstract

Membrane-active biomolecules often undergo conformational changes while in contact with lipid membranes. Confined geometry of lipid bilayers imposes severe restrictions on the molecular structure of peptides and proteins interacting with bilayers. As these molecules move from solution to membrane-bound states there are dramatic changes in their structure and/or aggregation due to the two different chemical environments.

In turn, change in shape and conformation of biomolecules may induce severe changes in bilayer structure, ranging from modulation of membrane permeability to pore formation and even rupture of the bilayer. Thus, shape and size variation are often required for membrane activity of biomolecules, however the key property for membrane activity is amphiphilic nature of biomolecules.

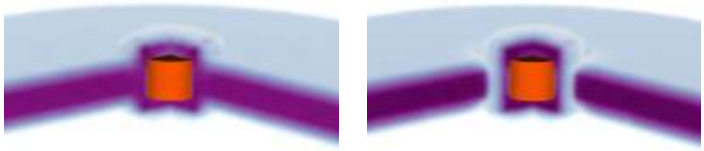

Fig. 1. Possible mechanism for permeation of lipid bilayers: slight shape variations of embedded protein induce a pore in the bilayer.

Using Single Chain Mean Field (SCMF) theory for lipid bilayers (Pogodin, Baulin, 2010) we show several examples of coupling between membrane activity and variation of conformation and biomolecules demonstrate that hydrophobic objects embedded into the membrane can be used as lipid ion channels, which open and close pores in lipid bilayers by tuning their shape and size (Fig 1), permeation of lipid bilayers induced by polymers adsorbing at lipid bilayers (Sommer et al., 2012) and how a regular surface patterning of Late Embryogenesis Abundant (LEA) proteins may facilitate membrane association and control the depth of the equilibrium their penetration into the bilayer (Pogodin et al., 2012) (Fig. 2).


Fig. 2. Upon stress conditions cells express LEA proteins, which self-assembly into rigid helixes. These proteins are membrane active and are able to modify the properties of the membranes.

## References

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