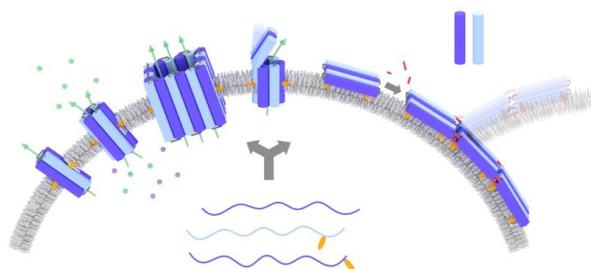


Using DNA to Cross Membrane Barriers

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Semifluid membranes enclose biological cells and drug delivery vehicles. Crossing the membrane barrier enables essential transport of molecular cargo. My talk presents routes to cross the barrier with synthetic transport channels made from DNA. Nucleic acids are easier to engineer than proteins of biological channels⁽¹⁾. The artificial DNA channels are composed of interlinked duplexes. Attached lipid anchors hold the negatively charged structures in the membrane^(2,3,4) based on rational design rules⁽⁵⁾. The DNA channels open and close in response to physical voltage stimuli, like natural templates^(3,4,6). The DNA versions can also mimic ligand-gated⁽³⁾ and temperature-gated channels⁽⁷⁾ to help release drugs or build cell-like networks. The artificial pores can be programmed into cytotoxic agents to kill cancer cells⁽⁸⁾, or to create porous bionanoreactors⁽⁹⁾. Other rationally designed DNA nanostructures extend the functional range and can control, for example, bilayer shape⁽¹⁰⁾. The presentation concludes with an outlook of how DNA nanotechnology at membrane interfaces can help replicate biological functions to open up new applications in nanobiotechnology and synthetic biology.



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