Collective phenomena in uptake of nanoparticles

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Abstract

Self-assembly of nanoscopic objects bound to biological membranes is at the core of inter- and intracellular trafficking. Resulting assemblies can collectively deform the underlying membrane and create global changes in the membrane shape and topology. We study physical mechanisms that drive higher organization of nanoparticles bound to fluid membranes via receptors of various physicochemical properties. Using computer simulations, we investigate the underlying membrane-mediated interactions, and the emerging organizational patterns. We show how membrane-orchestrated assembly can lead to collective uptake of nanoparticles, and demonstrate how collective phenomena can be exploited to target nanoparticle delivery to membranes of a desired receptor composition.