

PROBING MECHANICAL PRINCIPLES OF CELL-NANOMATERIAL INTERACTIONS

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Nanomaterials such as carbon nanotubes, nanowires, nanofibers and graphene have potential applications for next generation microchips, composites, barrier coatings, biosensors, and drug delivery. There is also an urgent need to understand the hazards of nanomaterials to health. In this talk, I will discuss some recent studies at Brown University on the mechanics of cell-nanomaterial interactions, including the mechanics of cellular uptake of nanoparticles by receptor-mediated endocytosis and coarse-grained molecular dynamics simulations of lipid bilayer segments interacting with nanoparticles. The discussions will be organized around the following questions: Why and how does cellular uptake of nanoparticles depend on the particle size, shape, aspect ratio and elasticity? In particular, we will discuss the effect of nanoparticle size on receptor-mediated endocytosis, the effect of elastic stiffness on cell-particle interactions and how cylindrical one-dimensional nanomaterials such as carbon nanotubes enter cells.

Keywords: Cell;nanomaterial;endocytosis;size effect;shape effect;