Systematic Exploration and Modulation of Nano-Bio Interactions

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Abstract : Nanomaterials are widely used in various industrial sectors, biomedicine, and more than 1300 consumer products. Although there is still no standard safety regulation, their potential toxicity is a major concern worldwide. We discovered that nanoparticles target and enter human cells1, perturb cellular signaling pathways2, affect various cell functions3, and cause malfunctions in animals4,5. Because the majority of atoms in nanoparticles are on the surface, chemistry modification on their surface may change their biological properties significantly. We modified nanoparticle surface using nano-combinatorial chemistry library approach6. Novel nanoparticles were discovered to exhibit significantly reduced toxicity6,7, enhance cancer targeting ability8, or re-program cellular signaling machineries7. Using computational chemistry, quantitative nanostructure-activity relationship (QNAR) is established and predictive models have been built to predict biocompatible nanoparticles.

Keywords : nanoparticle, nanotoxicity, nano-bio, nano-combinatorial chemistry, nanoparticle library

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