

Molecular Dynamics of Red Blood Cell Adsorption on Antimicrobial Surfaces

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Abstract

Nature, exploiting millions of years of evolution, has tweaked every single component of its vast machinery, which has often been of inspiration for mankind's inventions. Such is the case of Black Silicon Surfaces, an antimicrobial nanostructured material, designed after Cicada Wings, a naturally occurring antibacterial surface. Several experiments have elucidated the effectiveness of its mechanism, but scarce insight has been provided into the causes of the spontaneous rupture of bacterial membranes. The present research aims to offer such insight, approaching it from a theoretical perspective. We perform Molecular Dynamics Simulations of meshed Red Blood Cells and observe the deformations of their membrane upon adsorption onto the nanostructures. Further insight into the viscoelastic properties of Red Blood Cell membranes is provided by simulations of varying amounts of rigid spherical nanoparticles onto the membrane.