

عنوان مقاله:

The mechanical properties of a single cell measured by piconewton resolution reveal the mechanism of action of some drugs

محل انتشار:

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خلاصه مقاله:

Statins-family of drugs are commonly prescribed for hypercholesterolemia patients with both primary and secondary prevention in order to decrease the level of the blood cholesterol. Statin drugs, thus affect RBC mechanics indirectly through modulation of cholesterol content of the membrane. It is however unclear whether statin drug can directly affect RBC mechanics, or more broadly, mechanics of human cells. Optical tweezers are proven indispensable single-cell micro-manipulation and mechanical phenotyping tools. In this study we have used optical tweezers for measuring viscoelastic properties of human red blood cells (RBCs) and asked whether statin drugs, including Atorvastatin can directly affect RBC mechanics. Comparison of viscoelastic features of the healthy fresh and statin treated cells revealed that the Atorvastatin treatments soften the cells by about 25%. Using a simple modeling approach, we proposed a molecular model that explains the drug induced changes in viscoelastic properties of RBCs membrane. Our results reveal molecular interactions between drug and cytoskeleton proteins. We find that Atorvastatin can induce protein conformational changes that may lead to dissociation of cytoskeletal junctions and significant increase in the flexibility of the cell. Our findings also suggests that direct interactions between the drug and cytoskeletal components, namely F-actin-spectrin and ankyrin-spectrin complexes, underlie the drug-induced mechanical changes of the cells.

کلمات کلیدی:

Optical tweezers, Red blood cell, Atorvastatin, Protein conformational change

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