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Biomechanics and dynamics of red blood cells probed by optical tweezers and digital holographic microscopy NELSON CARDENAS, PATTRICK THOMAS, LINGFENG YU, Nanoscope Technologies LLC, SAMARENDRA MOHANTY — Red blood cells (RBC), with their unique viscoelastic properties, can undergo large deformations during interaction with fluid flow and migration through narrow capillaries. Both local and overall viscoelastic property is important for cellular function and change in these properties indicate diseased condition. Though biomechanics of the cells have been studied using variety of physical techniques (AFM, optically-trapped anchoring beads and microcapilary aspiration) in force regime $>$ 10pN, little is studied at low force regime $<$1pN. Such perturbations are not only hard to exercise on the cell membrane, but quantification of such deformations becomes extremely difficult. By application of low power optical tweezers directly on cell membrane, we could locally perturb discotic RBC along the axial direction, which was monitored dynamically by digital holographic microscopy-a real time, wide-field imaging method having nm axial resolution. The viscoelastic property of the RBC at low force regime was found to be significantly different from that of high-force regime. The results were found to be in good agreement with the simulation results obtained using finite element model of the axially-stretched RBC. The simulations and results of viscoelestic measurements will be presented.

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