Temperature dependence of cellular elasticity

Felix Rico, Calvin Chu and Vincent T. Moy

Dept. of Physiology and Biophysics - University of Miami School of Medicine

Abstract: The mechanical properties of living cells are considered as important as their biochemical properties in regulating cellular behavior. Although it is known that the major determinant of cell mechanics is the cytoskeleton, theories based on the biophysical properties its single molecular components are still deficient. Determining the mechanics of living cells under different physiological conditions may shed light into the ultimate molecular determinants of cell mechanics. In this work, the elastic properties of a monocytic cell line (THP-1) were measured at different temperatures using an atomic force microscope (AFM). Cells were immobilized on plastic dishes coated with poly-L-lysine and force curves were acquired at various velocities by indenting the cell surface with a spherical bead attached at the end of the AFM cantilever. The Young's modulus was computed by fitting the Hertz model to the approaching curve. The results showed that the Young's modulus of living cells significantly decreased with temperature. These findings may suggest that cell mechanics are governed by thermally activated processes, such as receptor-ligand unbinding and/or protein unfolding.