



Micromechanics and Microviscoelasticity of Cells

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Magnetic tweezer microrheometry combined with colloidal strain-field mapping enable local measurements of absolute Young moduli of cell envelopes. Microrheometry enables real time studies of rapid reorganizations of the membrane coupled actin cortex of vascular endothelial cells by activation with inflammatory agents (e.g. histamine involved in allergic reactions). Actin cortices are enforced by formation of stress fibers or micromuscles induced by a sol-gel transition triggered by activation of myosin and Ca-induced actin polymerization within ~ 1 sec. The reorganisation induces centripetal contractions of cells leading to the formation of gaps within the endothelium. Evaluations of the quasi-random transport of magnetic tweezers and creep responses show: the cytoplasm consists of soft streets separated by forbidden zones. The intracellular space behaves as viscoplastic body. Creep responses are described as random transitions within multiwell potentials. This enables weak forces (10 pN) to transport intracellular compartments through hard regions by statistical bond breakage.

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