

DEFORMATION-ENHANCED FLUCTUATIONS OF THE ERYTHROCYTE'S SPECTRIN-ACTIN NODES AND RELATION TO SINGLE MOLECULE MEASURES OF SPECTRIN UNFOLDING

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To assess local elasticity in the red cell's spectrin-actin network and understand the general nature of elastically constrained receptor motion, nano-particles were tethered to actin nodes or glycoporins and their constrained thermal motions tracked. Cells were immobilized as well as controllably deformed by aspiration into a micropipette. Since the network is well-appreciated as soft, thermal fluctuations even in an unstressed portion of network were expected to be many 10's of nanometers based on simple equipartition ideas. Real-time particle tracking indeed reveals such motions for 40-nm fluorescent beads either tethered to actin directly within a cell ghost or else tethered to actin from outside a cell via glycoporin. Moreover, the elastically constrained displacements are significant on the scale of the network's inter-nodal distance of ~60–80 nm. Surprisingly, along the aspirated projection – where the network is axially extended by as much as two-fold or more [1] – fluctuations in the axial direction are significantly *increased* by almost two-fold relative to motions in the unstressed network. A simple analytical model introduces the idea that this unexpected softening in the highly extended direction reflects forced unfolding of spectrin repeats, or else rapidly reversible dissociation within or between other network components. Atomic Force Microscopy data will be presented in support of the spectrin unfolding hypothesis.

REFERENCE

1. Lee, J.C-M., Wong, D. T. and Discher, D. E. Direct measures of large, anisotropic strains in deformation of the erythrocyte cytoskeleton. **Biophys. J.** 77 (1999) 853-864.