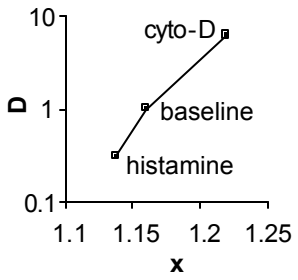
*American Journal of Respiratory and Critical Care Medicin*e, **165**:A671, 2002
International Conference of the
American Thoracic Society
Atlanta, May 17-22, 2002

NOISE TEMPERATURE DETERMINES CYTOSKELETAL (CSK) REMODELING IN HUMAN AIRWAY SMOOTH MUSCLE (HASM) CELLS

B. Fabry, J.P. Butler, J.J. Fredberg. Physiology Program, Harvard School of Public Health, Boston, MA, USA

The CSK of HASM cells behaves as soft glassy material whose ability to deform elastically and to flow is determined by a single parameter, the "noise temperature" (x) (*Phys Rev Lett* **87**:148102, 2001). The noise temperature is thought to be a measure of intracellular jostling of stress bearing elements relative to the height of energy barriers that constrain rearrangements of the elements. Here we tested the hypothesis that the noise temperature also determines the rate of cytoskeletal remodeling. Ligand-coated (RGD) ferromagnetic beads were attached to the surface of cultured cells, and spontaneous bead movements were continuously tracked to report rearrangements of CSK elements to which the beads were bound. Bead motion was expressed as mean square displacement (MSD). MSD increased with time (t) as $D\,t^{\alpha}$, with diffusion coefficient D and exponent $\alpha \approx 1.5$. An exponent of unity would be expected for a purely diffusive process. We also measured cell mechanics and noise temperature x of those cells by twisting the beads in a sinusoidal magnetic field. Actin depolymerization with cytochalasin-D caused both x and D to increase, while activating cells with histamine caused x and D to decrease. These data demonstrate that as the noise temperature falls there is a slowdown of CSK dynamics, and thereby support the hypothesis that the noise temperature x determines the rate of CSK remodeling.



Supported by HL65960