Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Cytoskeleton mediated spreading dynamics of immune cells
KING-LAM HUI, JESSICA WAYT, BRIAN GROOMAN, ARPITA UPADHYAYA, Department of Physics, University of Maryland — We have studied the spreading of Jurkat T-cells on anti-CD3 antibody-coated substrates as a model of immune synapse formation. Cell adhesion area versus time was measured via interference reflection contrast microscopy. We found that the spread area exhibited a sigmoidal growth as a function of time in contrast to the previously proposed universal power-law growth for spreading cells. We used high-resolution total internal reflection fluorescence microscopy of these cells transfected with GFP-actin to study cytoskeletal dynamics during the spreading process. Actin filaments spontaneously organized into a variety of structures including traveling waves, target patterns, and mobile clusters emanating from an organizing center. We quantify these dynamic structures and relate them to the spreading rates. We propose that the spreading kinetics are determined by active rearrangements of the cytoskeleton initiated by signaling events upon antibody binding by T-cell receptors. Membrane deformations induced by such wavelike organization of the cytoskeleton may be a general phenomenon that underlies cell movement and cell-substrate interactions.

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Date submitted: 21 Nov 2008 Electronic form version 1.4