Abstract for an Invited Paper
for the MAR10 Meeting of
The American Physical Society

Anisotropic viscoelastic properties and cytoskeletal structure of endothelial cells subject to shear flow

JUAN C. DEL ALAMO, University of California, San Diego

The cytoskeleton of adherent cells remodels in response to mechanical stimuli leading to a redistribution of intracellular forces that modifies cell function. We have analyzed the magnitude and anisotropy of the viscoelastic properties confluent vascular endothelial cells subject to continuous flow. For this purpose we used Directional Particle Tracking Microrheology, which measures the second-order tensor of intracellular marker displacements, allowing us to determine the principal directions of highest and lowest shear modulus at each position. We studied the orientation of these principal directions relative to the actin stress fibers. Before starting the flow, the cells' average cytoskeletal organization and shear modulus are isotropic. After the application of flow shear the cells' stress fibers gradually orient parallel to the flow and the principal directions of the shear modulus become parallel and perpendicular to the flow. The role of ATP-driven myosin-II contractions in the observed anisotropy is analyzed by using cells treated with drugs inhibiting myosin-II function.