

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

How substrate rigidity regulates the cellular motility ALIREZA SARVESTANI, University of Maine — Mechanical stiffness of bio-adhesive substrates has been recognized as a major regulator of cell motility. We present a simple physical model to study the crawling locomotion of a contractile cell on a soft elastic substrate. The mechanism of rigidity sensing is accounted for using Schwarz's two spring model (Schwarz et al. (2006) *BioSystems* 83, 225-232). The predicted dependency between the speed of motility and substrate stiffness is qualitatively consistent with experimental observations. The model demonstrates that the rigidity dependent motility of cells is rooted in the regulation of actomyosin contractile forces by substrate deformation at each anchorage point. On stiffer substrates, the traction forces required for cell translocation acquire larger magnitude but show weaker asymmetry which leads to slower cell motility. On very soft substrates, the model predicts a biphasic relationship between the substrate rigidity and the speed of locomotion, over a narrow stiffness range, which has been observed experimentally for some cell types.

Alireza Sarvestani
University of Maine

Date submitted: 19 Nov 2010

Electronic form version 1.4