Title: Integrated Computational and Experimental Approaches to Cancer Cell Mechanics and Dynamics

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The mechanical properties of cells have important implications in cell migration, force generation, and structure. Environmental factors, such as chemokines, flow, stiffness, and dimensionality can alter cell mechanical behavior. Certain mechanical signatures are starting to emerge that are indicative of pathophysiological states such as the metastatic phenotype. In our work, through an integrated experimental and computational approach, we investigate fundamental intra and extracellular properties and their role in regulating intracellular mechanics in tumor development and metastasis. Our results demonstrate that intracellular fluctuations are suppressed in 3D compared to 2D and are more solid-like due to altered active stress fluctuations from motor activity. Additionally, actin polymerization dynamics, which are modulated by a number of cytoskeletal regulatory proteins and associated pathways, some of which are deregulated in cancer, are shown to further alter intracellular motions, force generation, and network morphology.