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What do cell rheology experiments really measure?

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It is now widely appreciated that normal tissue morphology and function rely upon cells' ability to sense and generate forces appropriate to their correct tissue context. While the effects of forces on cells have been studied for decades, our understanding of how those forces propagate through and act on different cell substructures remains at an early stage. The last decade has seen a resurgence of interest, with a variety of different micromechanical methods in current use that probe cells dynamic deformation in response to a time varying force. Recently, it has been shown that the seemingly disparate findings from different labs can be fit into a single, workable consensus description. The ability of researchers to carefully measure the mechanical properties of cells subjected to a variety of pharmacological and genetic interventions, however, currently outstrips our ability to quantitatively interpret the data in many cases. Despite these challenges, the stage is now set for the development of detailed models for cell deformability, motility and mechano-sensing that are rooted at the molecular level.