Cell Dynamics: actomyosin-based force generating systems

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Epithelial cells represent 60% of the cells that form the human body and where more than 90% of all cancers derived. Epithelial homeostasis depends on the assembly and dynamics of an actomyosin-based cytoskeleton that provides architectural support and mechanical flexibility in epithelial cell morphology, proliferation and motility.

Recent studies have shown that hyperactivation of actomyosin-based systems leads to severe changes in epithelial cell and tissue morphology, resulting in abnormal proliferation and malignant transformation. This process is accompanied by a high degree of cell invasiveness in a process commonly known as metastasis. There is an emergent interest to understand the mechanics of actomyosin cytoskeleton and its implication in cancer. However, the karyotypic plasticity and rapid evolvability of cancer cells prevented the development of an unifying approach explaining the mechanics of cell proliferation. Our laboratory combines quantitative cell imaging analysis, genetic engineering, cell biology, nanoscale reconstituted systems and computational approaches to ultimately develop a biomechanical model describing force generation in actomyosin-based systems responsible for cell dynamics.

(1) Rubinstein, B., Pinto, Inês M. (2015). *Epithelia migration: a spatiotemporal interplay between contraction and adhesion.* Cell Adhesion and Migration.
(2) Pinto, Inês M., Rubinstein, B., Li, R. (2013). *Force to divide: structural and mechanical requirements for actomyosin contraction.* Cell press, Biophysical Journal.