CDB SEMINAR

Martin Stewart

ETH Zürich, Dept. BioSystems Science and Engineering

Thursday, April 25, 2013

16:00~17:00 A7F Seminar Room

Rounding up on Cell Shape: Mitotic Cell Rounding as Model Problem in Cell Shape

Summary

Upon entry into mitosis, most animal cells undergo a major morphological transition into spherical shape. This shape change, known as mitotic cell rounding (MCR) has recently been demonstrated to serve important functions in cell division and tissue organization. My talk will summarize the state of knowledge in this small (~50 papers) field and present key results from our laboratory. Over the last 5 years, our laboratory has taken a biophysical approach to investigating the mechanics of MCR by using atomic force microscopy (AFM) in combination with advanced live cell imaging.AFM-based mechanical measurements with tipless cantilevers have demonstrated that cells possess an intracellular pressure that increases more than three-fold upon entry into mitosis and correlates with MCR By verifying models of cell shape based on the law of Laplace, we show that this pressure is related to actomyosin-based surface tension, and demonstrate how this pressure is linked with dynamic distribution of F-actin and myosin II trans-mitosis. Furthermore, to investigate other novel genes that might be involved in MCR, we have also undertaken mechanical phenotyping of mitotic cells with RNAi screening and have identified a number of key proteins. This talk will summarize how changes in mechanical parameters such as intracellular pressure surface tension and adhesion, as dictated by the activities of cytoskeletal, membrane and regulatory proteins, converge to drive MCR.

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