

Students' Annual Webinar

Collective heterogeneity of mitochondrial potential in contact inhibition of proliferation

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In the epithelium, cell density and cell proliferation are closely connected to each other through contact inhibition of proliferation (CIP). Depending on cell density, CIP proceeds through three distinct stages, namely the free-growing stage, the pre-epithelial transition stage, and the post-epithelial transition stage. Previous studies have elucidated how cell morphology, motion, and mechanics vary in these stages. However, it remains unknown whether cellular metabolism also has a density-dependent behaviour. Here by measuring the mitochondrial potential of cells, we unveil a heterogeneous landscape of metabolism which appears distinct in different stages of CIP. Importantly, in the pre-epithelial transition stage, the epithelial cells establish a collective metabolic heterogeneity wherein multicellular clusters of high and low-potential cells emerge, despite the uniform genetic and nutrient conditions for the cells. Next, to study the underlying dynamics, we constructed a system-biological model, which predicted the role of cell proliferation in metabolic potential towards establishing collective heterogeneity. Finally, experiments perturbing the actomyosin contractility revealed that while metabolic heterogeneity was maintained in absence of actomyosin contractility, it's ab initio emergence depended on the latter. Taken together, our results revealed a density-dependent collective heterogeneity in the metabolic field of a pre-epithelial transition stage epithelial monolayer, which may have significant implications for epithelial form and function.

Friday, Mar 3rd 2023

2:00 PM (Tea / Coffee 1.45 PM)

Seminar Hall, TIFR-H