



Colloquium

Institute Colloquium: Geometric and mechanical material constraints guide: collective

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Host:

The collective migration of cells is fundamental to epithelial biology. One of the hallmarks of collective behavior in migrating cohesive epithelial cell sheets is the emergence of so called leader cells. These cells exhibit a distinct morphology with a large and highly active lamellipodium. Although it is generally accepted that they play a crucial part in collective migration, the environmental and biophysical factors that regulate their formation remain unknown.

Here we discuss that a geometry - based cue imposed by the matrix environment like local curvature of the collective's perimeter is capable of triggering leader cell formation and promoting enhanced motility at defined positions. Remarkably, the extent of this effect scales with the magnitude of the curvature.

Cytoskeletal tension was found to be important for geometry induced leader cell formation, as cells treated with tension reducing agents appeared less sensitive to local curvature. Accordingly, traction force microscopy revealed an increased level of shear stress at highly curved positions even before the cell migration had actually started, indicating the presence of a collective polarization induced by the geometry of the confinement.

Together our findings suggest that high curvature leads to locally increased stress accumulation, mediated via cell - substrate interaction as well as via cytoskeleton tension. The stress accumulation in turn enhances the probability of leader cell formation as well as cell motility. This work defines the importance of geometric cue such as local curvature in the collective migration dynamics of epithelial cells and thus shows implications for the material and biophysical regulation of epithelium during wound healing, embryonic development, and oncogenesis.

Monday, March 31, 2014 04:30pm - 05:30pm

Raiffeisen Lecture Hall, Central Building



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