Invited talk

Sensing the curve and the spatial confinement: mechanobiology of epithelial tissues

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The directed migration of epithelial cell collectives through coordinated movements is key to many physiological and pathological processes and is often study at the level of large confluent monolayers. However, numerous migration processes rely on the migration of small groups of polarized epithelial clusters and their responses to external geometries. In the meantime, the development and functioning of many organisms involves the folding of epithelial monolayers that must adapt to variations of local curvature.

Despite their importance on the homeostasis of epithelial systems, spatial confinement and curvature changes are difficult to reproduce, limiting our understanding of these complex mechanisms[1]. In this presentation, we will first introduce well-defined *in vitro* systems based on micropatterned adhesive stripes to investigate the migration of small epithelial clusters with well-defined geometries. We will highlight the importance of geometry in defining the migration properties of individual cells[2] and cell clusters[3], providing a conceptual framework to extract interaction rules from how active systems interact with physical boundaries. In a second part, we will introduce a photopolymerization technique using optical photomasks to form wavy hydrogels, allowing to examine how concave and convex curvatures affect the mechanical properties of epithelial monolayers[4] and induce nuclear deformations[5]. We will show that active cell mechanics and nuclear mechanoadaptation are key players of the mechanistic regulation of epithelia to substrate curvature.

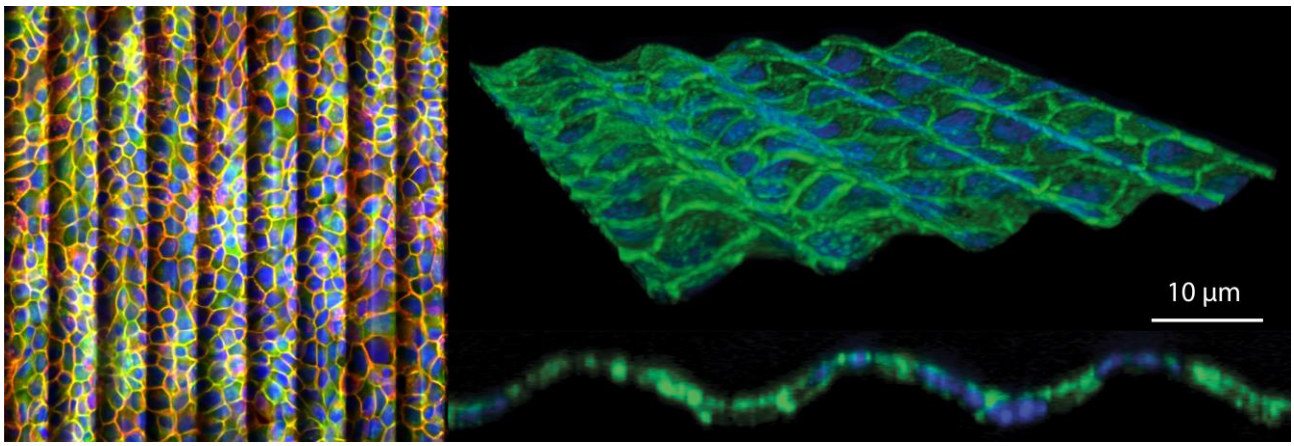

Figure 1. Top (left) and side (right) confocal views of wavy epithelial monolayers cultivated on corrugated hydrogels and immunostained for actin (green), DNA (blue) and cadherin (red). The scale bar is 10 µm.

References

[1] M. Luciano et al. *Biophys. Rev.* 3, 011305 **2022**
[2] D. Mohammed et al. *Nat. Phys.*, 15, 858-866 **2019**
[3] E. Vercruysse et al. *bioRxiv* **2022**
[4] M. Luciano et al. *Nat. Phys.*, 17, 1382-1390 **2021**
[5] Y. Kalukula et al. *Nat. Rev. Mol. Cell Biol*. 23, 583–602 **202**