

[C3] Hydrodynamic model of epithelial tissues

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Recently, as a part of the advance in the research of active soft matters, generalized hydrodynamic theory has been applied to biological tissues with much success. Stratified epithelium is a special example of biological tissues due to the layered distribution of proliferative cells and differentiated cells. The slow dynamics of stratified epithelium therefore should reflect such spatial inhomogeneity. In talk I will show that the tissue dynamics predicted by a theoretical model with tissue viscosity that reflects such stratified structure indeed is quite different from a simpler model that assumes a constant tissue viscosity. In particular, when the proliferative cells occupy a thin region close to the basal membrane, the relaxation towards a tissue steady state is enhanced by cell division and cell apoptosis. On the other hand, when the region where proliferative cells reside becomes sufficiently thick, a flow induced by cell apoptosis close to the apical surface could enhance small perturbations. This destabilizing mechanism is general for continuous self-renewal multi-layered tissues, it could be related to the origin of certain tissue morphology and developing pattern.