CDB SEMINAR

Yu-Chiun Wang

Department of Molecular Biology,
Princeton University

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16:00~17:00 A7F Seminar Room

How changes in cell polarity orchestrate the folding of a tissue

Summary

During animal development, cells that are initially identical in morphology undergo distinct changes to collectively construct complex tissue structures. One such process, epithelial folding, allows a two-dimensional sheet of epithelium to deform and buckle, ultimately producing a three-dimensional structure such as a shallow groove, a deep fold, or an internalized tube. A general theme has emerged whereby localized cell shape changes initiate epithelial folding. Such cell shape changes are typically induced by spatially-restricted accumulation of the molecular motor myosin. While myosin-driven cell shape changes appear to be widespread, it is not known whether other initiation mechanisms exist. Using an integrated approach of quantitative live imaging and genetic manipulation, I identified an alternative mechanism for the initiation of epithelial folding that involves modification of apical-basal polarity and a resultant repositioning of adherens junctions. These changes lead to local cell shortening and deformation of the tissue. In addition, I defined regulated junctional restructuring as a novel pathway that controls the extent of invagination, allowing two tissue folds that undergo an identical process of initiation to invaginate to distinct degrees. Not only do these observations provide new insights into potentially diverse mechanisms of epithelial folding, they also have broad implications in how modification of cell polarity alters cell shape, how changes in junctional positioning influence cell surface mechanics, and how junctions transmit and propagate morphogenetic forces to shape the tissue structures. I will discuss all of these issues both within the context of my experimental system and more generally during tissue morphogenesis of polarized epithelial tissues.

Host:
Shigeo Hayashi
Morphogenetic Signaling, CDB
shayashi@cdb.riken.jp
Tel:078-306-3185 (ext:1523)