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TEMASEK LIFESCIENCES LABORATORY

14 March 2016 (Monday), 4pm
The Auditorium (Level 1)

Hosted by: Dr Fumio MOTEGI

Genetics and mechanics of epithelial sheet invagination

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D. Shigeo Hayashi is a team leader in RIKEN CDB since 2002. His research interest focuses on mechanisms of morphogenesis from cell to organismal levels.

Invagination is the key morphogenetic process for separating organ primordia from multipotent epithelial precursors. Precise timing and position of invagination is essential for coordinating development of organs with other body parts. Organ placode consists of columnar epithelium stably assembled by cell-cell and cell-basement membrane adhesion. In order to introduce acute bending into the epithelium, its stability must be broken in a specific position and tissue-level force must be applied to the direction perpendicular to the plane of epithelium. Apical constriction and cell shape change from columnar to a flask shape are known mechanisms used in a number of cases including neural tube closure and gastrulation. Our lab studies this problem by using Drosophila tracheal system. In this seminar, I introduce a novel mechanism of invagination driven by mitotic cell rounding. We also show that tracheal placode invagination is highly robust system driven by three overlapping mechanisms. General implication and mechanical aspects of this process will be discussed.

Recent Publications:

1. Kondo T., **Hayashi S**. Mitotic cell rounding accelerates epithelial invagination. Nature (2013)
2. Dong B., Hannezo E., **Hayashi S**. Balance between Apical Membrane Growth and Luminal Matrix Resistance Determines Epithelial Tubule Shape Cell Reports (2014)
3. Kato K., Dong B., Wada H., Tanaka-Matakatsu M., Yagi Y., **Hayahsi S.** Microtubule-dependent balanced cell contraction and luminal-matrix modification accelerate epithelial tube fusion. Nature Communications (in press).