ASHBi SEMINAR

Cellular mechanisms underlying tissue patterning in the mammalian embryo

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Time 16:00 – 17:00 [JST]

Venue Conference Room Onsite Only*
B1F, Faculty of Medicine Bldg. B

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Abstract

Tissue patterning requires coordination between cell dynamics, fate specification and morphogenesis. Understanding how these processes are coupled to achieve patterning precision despite their inherent variability remains challenging. We investigate cell dynamics in the mouse embryo to study how salt-and-pepper epiblast (EPI) and primitive endoderm (PrE) cells spatially segregate and pattern the inner cell mass of developing blastocysts. Quantifying cellular dynamics and mechanics show a key role for the autonomously acquired apical polarity of mouse PrE cells in coupling cell fate and dynamics. Apical polarity enables the formation of actin protrusions in PrE cells and is required for Rac1-dependent migration towards the ICM surface, where PrE cells are trapped due to decreased tension. Simultaneously, PrE cells deposit extracellular matrix components to build a gradient across the inner cell mass, breaking tissue-level symmetry and collectively guiding PrE cell migration. Embryo size perturbations of mouse blastocysts, and comparison of cell type proportions with monkey and human blastocysts further demonstrate that the fixed proportion of EPI/PrE cell types is optimal for tissue size and embryo geometry, and ensures patterning robustness during development.

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