Seminar/Talk

Investigating how mechanical perturbation and tissue architecture affect cell behaviours in pseudostratified epithelia of D.melanogaster

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Host: Carl-Philipp Heisenberg

Epithelia form protective barriers, lining every organ surface and cavity of an animal. Throughout dynamic morphogenetic events and homeostatic cell divisions, epithelia must maintain complete integrity, yet these underlying mechanisms are unclear. We aim to elucidate how epithelial integrity is ensured throughout development by utilising the Drosophila imaginal wing disc. The wing disc possesses pseudo-stratified epithelia that transforms in structure and requires specialised regulation of cell division, proving a useful model to explore mechanisms that maintain integrity at the tissue and cellular level. First, we investigated the tissue response to mechanical stretching in order to identify the mechanisms that act to prevent tissue rupture during dynamic tissue rearrangement. We found a stretch-sensitive pathway that polarises myosin into cable-like structures, dependent on actin reorganisation. The cables rigidify the tissue whilst remodelling occurs and prevent injury to the tissue from propagating beyond the injury boundary. Second, we investigated the mechanisms that maintain tissue integrity during cell division. As a hallmark of pseudo-stratification, the emergence of stratified nuclear layers requires individual cells to actively translocate their nuclei to the apical surface for mitosis, a process known as inter-kinetic nuclear migration (IKNM). This enables mitotic cells to maintain adhesion and cell polarity. As tissue shape and density are ever-evolving during development, we explored how IKNM is affected by tissue properties. We found that developmental and mechanical increases in tissue compaction influence IKNM dynamics and suggest that the pseudo-stratified structure exerts confinement upon the nuclei. We also identified a novel role for lateral adhesions in mediating proper nuclear movement, in addition to regulators of actin polymerisation. We are currently investigating our candidate proteins during alterations in tissue compaction to infer their role in IKNM.This work has unveiled mechanisms that operate at the tissue and cellular level to ensure robust maintenance of epithelial integrity during development.

Friday, May 25, 2018 11:00am - 12:15pm
Meeting room 2nd floor / Bertalanffy Bldg. (I04.2OG - LAB)

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