

BDR SEMINAR in Kobe

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The Hospital for Sick Children, Canada

Monday, May 27, 2019

16:00-17:00, 7F Seminar Room, DB Building A

Mechanical forces influence three-dimensional cell behaviours in the mouse embryo

Summary

A fundamental question in developmental biology is the how organs are shaped. Morphogenesis has long been recognised as an inherently physical process. In recent years, we have been combining data from live light sheet imaging with biophysical approaches and genetics to study solid organ primordia such as the limb buds and branchial arches in the mouse embryo. We showed how physical tissue stress is regulated by developmental pathways to orient cell rearrangements that remodel ectoderm^{1,2}). More recently, we tackled the challenge of 3D mesenchymal morphogenesis by generating a magnetic tweezer system to map tissue stiffness³) and a genetically encoded FRET-based force sensor to measure cortical forces of individual cells *in vivo*⁴). The emerging data suggest that two modes of cell movement, rearrangements and crawling, both contribute to collective mesenchymal cell movements that shape organ primordia. Cell rearrangements can be considered to result from liquid-like rigidity phase properties that are determined by cellular geometries and oscillations. There is correlative evidence that cell crawling is oriented by durotaxis, or the movement of cells up a stiffness gradient. In this seminar, I show our current research and discuss our attempts to bridge collective multicellular behaviours to organ shape.

1) Lau, K., Tao, H., *et al.*, Nat Cell Biol. 2015

2) Wen, J., *et al.*, Biophys J. 2017

3) Zhu, M., Tao, H., *et al.*, bioRxiv 412072 2018

4) Tao, H., *et al.*, Nat Comm. 2019 in press



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