CDB SEMINAR

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UC-Berkeley

Monday, December 18, 2017

~~14:00-15:00~~ **15:00-16:00** Seminar Room A7F

TRAIL-ing the ECM for Cell Motility in Organ Morphogenesis

Summary

Cell migration is indispensable to tissue morphogenesis and homeostasis. Live imaging allows mechanistic insights, but long-term observation can alter normal biology, and tools to track movements in vivo without perturbation are lacking. We develop a tool called M-TRAIL, which reveals migration histories in fixed tissues. By making clones that overexpress GFP-tagged extracellular matrix (ECM) components, motility trajectories can be mapped based on durable traces deposited onto basement membrane (BM). We first applied M-TRAIL to Drosophila follicle rotation, comparing in vivo and ex vivo migratory dynamics, facilitated by a new image analysis platform called ImSAnE that projects 3D organ surfaces onto a 2D plane. Interestingly, M-TRAIL demonstrates that follicles carrying intracellularly-truncated atypical protocadherin Fat2, previously reported to lack rotation, in fact rotate in vivo at a reduced speed. The results revalidate the model that rotation is required for tissue elongation, and show how reliance solely on ex vivo imaging can mislead.

We have now utilized M-TRAIL and ImSAnE in an in toto morphometrics analysis workflow to determine the cell behaviors that actually elongate the follicle, and find that an unexpected mechanism of spatiotemporally restricted anisotropic growth is the major contributor. Interestingly, our previous work has demonstrated that follicle elongation is driven by a stiffness gradient patterned into the extracellular matrix, rather than anisotropic tension patterned within the cells. Since ECM-regulated elongation and polarized cell growth are also seen in Drosophila trachea, the data suggest that elongation of tubular organs may require this distinct morphogenetic cellular behavior.

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