NUS National University of Singapore | Department of Biological Sciences, Faculty of Science

SEMINAR

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Hosted by Prof Thorsten Wohland

Emergence of organ shape during development

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During development, organs form precise shapes that are crucial for their proper function in adults. However, how complex organ shapes emerge during development is poorly understood for nearly all organs. Shaping an organ requires careful synchronisation of temporal and spatial signals, as well as mechanical inputs. Here, I focus on how the heart and myotome reliably form specific morphologies.

The underlying transcriptional network defining the heart is conserved from *Drosophila* to humans. Embryonic hearts typically first form as a tubular structure, derived from parallel lines of cardioblasts. How does this structure reliably form? We show that during cardiogenesis, distinct spatial and temporal signals interact during heart vessel formation the *Drosophila* embryo. Mechanical forces integrate these signals to ensure robust cell alignment.

Swimming fish have a distinctive “chevron” shape in their myotome (back muscles). How does such a shape emerge? We show that processes within the developing myotome – such as muscle elongation – play a critical role in forming the chevron shape. However, these are insufficient to generate the final chevron shape. Differential inter-tissue mechanical coupling is required to form the chevron-shaped myotome. We also show that the cellular rearrangements that occur during myotome formation act as a “timer” that regulate the temporal window for readout of the morphogenetic signal from Sonic Hedgehog.