Tata Institute of Fundamental Research
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Seminar

Force patterning in the generation of order in the auditory epithelium

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For physiological function, organs must organise constituent cell types in precise spatial and orientational order. While in single-cell type epithelia, morphogenesis is driven by forces exerted at cell junctions, it is not known whether forces can drive the acquisition of patterns and polarity in organs comprising multiple cell types. We investigate the process of global alignment in the avian auditory epithelium. This consists of two cell types, hair cells (HCs), with an asymmetric mechanosensory hair bundle on its apex, and supporting cells (SCs). During development, these two cell types form a regular pattern, and the hair bundle of each HC aligns with the tissue axis. Through a combination of experiments and theory, we find that tissue-wide force patterning generates both positional and orientational order. Positional order is established by differences between the mechanical activities of cell-cell junctions. These differences are encoded by cell-specific genetic programmes restricting the di-phosphorylated form of non-muscle myosin-II regulatory light chain (RLC) to specific junctions. Importantly, the hair bundle organises supracellular patterns of myosin activity through the local attenuation of RLC phosphorylation, generating global polarity across the entire tissue. Our findings show that junctional asymmetries couple cell rearrangements to polarity, potentially a fundamental feature of development and repair in tissues consisting of different cell types.

Wednesday, Jun 28th 2023

11:30 AM (Tea / Coffee 11.15 AM)

Auditorium, TIFR-H