CDB SEMINAR

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Thursday, May 22, 2014

16:00~17:00 A7F Seminar Room

Anisotropic stress orients remodelling of mammalian limb bud ectoderm

Summary

Physical forces that shape embryonic tissue are not well understood in vivo, especially among later vertebrates. In the early limb bud, convergence of ectoderm from dorsal and ventral sides forms the apical ectodermal ridge (AER), though cellular and physical mechanisms underlying this process are unclear. By using live imaging of wild type and conditional mutant mouse embryos, we show that ectodermal remodelling involves complex cell rearrangements that are conserved with modification relative to those of invertebrates. Using a combination of theoretical finite element modelling as well as measurement and manipulation of actual physical parameters in vivo by laser ablation and atomic force microscopy, we show that mesodermal pressure and ectodermal tension together orient ectodermal remodelling and shape the early bud in 3D. Initial expansion of mesoderm anisotropically stresses ectoderm to polarise cortical actin among AER progenitors, a process that requires Tcf/Lef activation. Subsequent intercalation of AER progenitors generates a tensile gradient that passively orients resolution of multicellular rosettes on adjacent surfaces, a process facilitated by β-*catenin*-dependent attachment of cortex to membrane. In the mouse limb bud therefore, key pathways transduce global stress pattern to orient cell rearrangements that define tissue shape.

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