CDB SEMINAR

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16:00~17:00 C1F Auditorium

Neural stem and progenitor cells and the evolution of the cerebral cortex

Summary

Our group studies the molecular and cellular mechanisms of neurogenesis in the developing neocortex in the context of mammalian brain evolution, specifically the various types of cortical stem and progenitors cells and their modes of division. In terms of their cell biology, two principal classes of cortical stem/progenitors cells can be distinguished. One class comprises stem/progenitor cells exhibiting bipolar morphology and apical-basal cell polarity that divide at the ventricular, i.e. apical, surface of the ventricular zone. These are the neuroepithelial cells and apical radial glial cells, which are collectively referred to as apical progenitors (APs). The other class comprises stem/progenitor cells dividing in a more basal, abventricular location, notably the subventricular zone, which are collectively referred to as basal progenitors (BPs). These fall into two subclasses (i) radial glia-related progenitors exhibiting monopolar morphology and basal, but not apical, cell polarity, referred to as basal radial glial cells (bRGCs); and (ii) progenitors exhibiting nonpolar morphology and lacking overt apical-basal cell polarity, which comprise transit-amplifying progenitors (TAPs) that undergo multiple rounds of cell division and intermediate progenitor cells (IPCs) that undergo only one round.

Our group has been studying the following issues related to these progenitor cells in the embryonic mouse, ferret, marmoset, macaque and human neocortex:
(1) the various lineages from APs to BPs and neurons and their impact on neuron number;
(2) the machinery underlying BP delamination, focusing on the primary cilium and centrosome;
(3) the relationship between cell polarity and cleavage plane orientation in the context of symmetric *versus* asymmetric progenitor cell divisions;
(4) the role of the microcephaly gene Aspm;
(5) the cholesterol-binding apical membrane protein prominin-1/CD133;
(6) prominin-1–bearing extracellular membrane particles released into the ventricular fluid from the midbody and primary cilium of APs, and their role in differentiation;
(7) the basal process of APs and bRGCs and its role in extracellular matrix-dependent, integrin-mediated progenitor self-renewal;
(8) the role of cell cycle length in stem and progenitor cell proliferation *versus* differentiation;
(9) the comparative analysis of the transcriptomes of the various progenitor types in embryonic mouse and fetal human neocortex, and the cross-species transfer of transcriptomes by microinjection of single progenitors in organotypic slice culture.

Recent insights relevant for understanding the evolution of the neocortex will be presented.

Host:
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