Graduate School Event

Thesis Defense: Unraveling the Role of Pten in Cortical Stem Cell Lineage Progression using MADM

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Host: Sandra Siegert

Cortical development has been studied for many decades and with each passing year, we learn more about the processes that govern the tightly regulated developmental program. Up until recently, the field has struggled to gain reliable access to progenitors at the single-cell level, limiting the resolution at which we can study cortical development in vivo. Therefore, much of the data we have on mammalian cortical development is at the cell population level. The subsequent pages of this thesis describe novel elements of cortical development in mice, acquired by using a candidate gene approach in conjunction with Mosaic Analysis with Double Markers (MADM) to achieve single cell resolution. In this thesis, I briefly provide an overview of the state of the field, describe the methodology used to quantify morphological characteristics of neurons and glia, and delve into the role of Pten in neurogenesis and gliogenesis in the developing mouse cortex. By using MADM to generate genetic mosaics, in which only a small fraction of cells are mutated, to study population-level changes, we can bypass the early postnatal lethality reported in Pten conditional knockouts (cKOs) using Emx1-Cre. Pten-mutant neuron populations within the mosaics were significantly expanded. We used Emx1-CreERT2 to induce clonal deletion of Pten, and quantify RGP neurogenic output at the single progenitor level. In the latter parts of this thesis, we described how Pten deletion leads to an increase in the abundance of astrocytes. We availed ourselves of the flexibility offered by the MADM system to generate Pten mosaics within a series of distinct knockout tissues to test for the interactions between Pten and a battery of genes involved in several pro-gliogenic signaling pathways. Our survey of Pten's interactions with genes in key signaling pathways reveals that Erk1/2 are the critical effectors downstream of EGFR signaling essential for gliogenesis. Our results demonstrate that Pten plays critical and distinct roles throughout cortical RGP lineage progression.

Monday, August 18, 2025 02:00pm - 03:00pm

Office Bldg West / Ground floor / Heinzel Seminar Room (I21.EG.101) and Zoom

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.