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FAU Friedrich-Alexander-Universität Erlangen-Nürnberg

EBM Seminar Talk

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Cellular and genetic mechanisms of cerebral cortex folding

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Abstract: One of the most prominent features of the human brain is the fabulous size of the cerebral cortex and its intricate folding, both of which emerge during development. Cortical size is determined by the balance between progenitor cell self-renewal and neurogenesis. Cortical folding depends on the abundance of a particular type of basal progenitor, basal Radial Glia Cells (bRGCs), which abundantly populate a unique germinal layer, the Outer Subventricular Zone (OSVZ). The OSVZ and its bRGCs are key in driving cortex folding and establishing its highly stereotyped patterns, which are defined by a protomap of transcriptional signatures along cortical germinal layers. Recent findings from Victor Borrell's laboratory will be discussed, revealing novel cellular and genetic mechanisms that regulate cortical expansion and folding. The contribution of epigenetic regulation to the establishment of the cortex folding protomap has been uncovered, modulating the expression levels of key transcription factors that control progenitor cell proliferation and cortex folding. At the single-cell level, an unprecedented diversity of progenitor cell classes has been identified in the ferret and human embryonic cortex. These classes are differentially enriched in gyrus or sulcus regions and establish parallel cell lineages, which are not observed in mice. These findings support the notion that genetic and epigenetic mechanisms in gyrencephalic species diversify cortical progenitor cell types and implement parallel cell lineages, driving the expansion of neurogenesis and patterning cerebral cortex folds.

Bio-sketch: Víctor Borrell is a Research Professor at the Spanish Superior Council of Scientific Research (CSIC), Institute of Neuroscience Alicante. He has dedicated his scientific career to understanding mechanisms of embryonic brain development. His research focuses on the cellular, molecular, and genetic mechanisms underlying the expansion and folding of the cerebral cortex in large mammals, and how these mechanisms have evolved. His laboratory combines various techniques and approaches to study this process, including single-cell transcriptomics, proteomics, genetic manipulation, experimental embryology, live imaging, and standard histological and molecular biology methods. They study a range of species, including humans, to gain insights into the developmental mechanisms involved in cerebral cortex expansion and folding. His research has been published in top journals and has been highly cited, positioning his laboratory among the most influential in the field. Víctor Borrell has received numerous awards and grants for his contributions to neuroscience research.

You can download a detailed CV of Victor Borrell by clicking **here**.