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Sommario/riassunto

The brain consists of a complex but precisely organized neural network, which provides the structural basis of higher order functions. Such a complex structure originates from a simple pseudostratified neuroepithelium. During the developing mammalian cerebral cortex, a cohort of neural progenitors, located near the ventricle, differentiates into neurons and exhibits multi-step modes of migration toward the pial surface. Tight regulation of neurogenesis and neuronal migration is essential for the determination of the neuron number in adult brains and the proper positioning of excitatory and inhibitory neurons in a specific layer, respectively. In addition, defects in neurogenesis and neuronal migration can cause several neurological disorders, such as microcephaly, periventricular heterotopia and lissencephaly. Recent advances in genetic approaches to study the developing cerebral cortex, as well as the use of a number of novel techniques, particularly in vivo electroporation and time-lapse analyses using explant slice cultures, have significantly increased our understanding of cortical development. These novel techniques have allowed for cell biological analyses of cerebral cortical development in vivo or ex vivo, showing that many cellular events, including endocytosis, cell adhesion, microtubule and actin cytoskeletal regulation, neurotransmitter release, stress response, the consequence of cellular crowding (physical force), dynamics of transcription factors, midbody release and polarity

transition are required for neurogenesis and/or neuronal migration. The aim of this research topic is to highlight molecular and cellular mechanisms underlying cerebral cortical development and its related neurological disorders from the cell biological point of views, such as cell division, cell-cycle regulation, cytoskeletal organization, cell adhesion and membrane trafficking. The topic has been organized into three chapters: 1) neurogenesis and cell fate determination, 2) neuronal migration and 3) cortical development-related neurological disorders. We hope that the results and discussions contributed by all authors in this research topic will be broadly useful for further advances in basic research, as well as improvements in the etiology and care of patients suffering from neurological and psychiatric disorders.