Neural progenitors, patterning and ecology in neocortical origins

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Abstract

The anatomical organization of the mammalian neocortex stands out among vertebrates for its laminar and columnar arrangement, featuring vertically oriented, excitatory pyramidal neurons. The evolutionary origin of this structure is discussed here in relation to the brain organization of other amniotes, i.e., the sauropsids (reptiles and birds). Specifically, we address the developmental modifications that had to take place to generate the neocortex, and to what extent these modifications were shared by other amniote lineages or can be considered unique to mammals. In this article, we propose a hypothesis that combines the control of proliferation in neural progenitor pools with the specification of regional morphogenetic gradients, yielding different anatomical results by virtue of the differential modulation of these processes in each lineage. Thus, there is a highly conserved genetic and developmental battery that becomes modulated in different directions according to specific selective pressures. In the case of early mammals, ecological conditions like nocturnal habits and reproductive strategies are considered to have played a key role in
the selection of the particular brain patterning mechanisms that led to the origin of the neocortex.

**Keywords:** antihem, cortical hem, dorsal ventricular ridge, intermediate progenitors, nidopallium, Pax6, subventricular zone, reelin

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