NEURAL DEVELOPMENT

Neurogenesis ends near the beginning

In rodent mammals, substantial numbers of new neurons that are destined for the olfactory bulb are produced in the subventricular zone (SVZ), but whether this occurs in adult humans remains controversial. Sanai *et al.* now show that in humans, robust neurogenesis is present in neonatal infants, with streams of neural progenitors migrating both rostrally, and medially to the prefrontal cortex. Crucially, however, they find that this neurogenesis declines sharply during childhood and is virtually absent by adulthood.

Using a paediatric tissue bank, the authors performed fluorescent immunohistochemistry, *in situ* hybridization and ultrastructural analysis of brain tissue (taken at autopsy from children and adults) from the anterior horn of the lateral ventricle to identify the various cell types that were present and their location within the SVZ. These experiments confirmed earlier reports that the adult human SVZ has a markedly different structure from rodents — it has a hypocellular gap layer that lies between the ependymal lining of the lateral ventricle and a ribbon of migrating immature astrocytes.

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Sanai *et al.* also found that the SVZ of infants is densely populated with migrating immature neurons. By about 18 months of age, however, they found that this population of cells declines in number, as do proliferating cells, and that the gap layer becomes evident. The results of this study lend further support for a very low level of immature migrating neurons from the SVZ in the mature nervous system. The implications for neurogenesis in the human adult brain are not clear: astrocytic ribbon cells can function as stem cells *in vitro*, but whether they can perform a similar function *in vivo* remains undetermined.

Similarly, although the rostral migratory stream (RMS) in young children consisted of continuous chains of migrating immature neurons from the SVZ to the olfactory peduncle, these chains were absent in tissue samples from children aged 7 years and over (occasional cells expressing markers for immature migrating neurons were observed).

Interestingly, Sinai *et al.* showed that more distal parts of the infant RMS contained fewer cells than proximal regions. The authors found that this difference is the result of an additional migratory stream of immature neurons that are destined for the ventromedial prefrontal cortex, and that declines after 6 months of age.

Together, these data indicate substantial neuronal precursor migration in the brains of babies and young children, and reveal an intriguing medial migration of these cells to a specific cortical area, processes that might be crucially affected during neonatal injury or disease. Might additional chains of neuroblasts invest other regions of the brain during early development? This study opens up such questions for study that could yield further insights into the generation of human brain complexity.

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ORIGINAL RESEARCH PAPER Sanai, N. *et al.* Corridors of migrating neurons in the human brain and their decline during infancy. *Nature* 28 Sep 2011 (doi:10.1038/nature10487)