Mammalian neurogenesis breaks into the most static brain region

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Fifteen years ago, the discovery of adult neurogenesis (the production of new neurons) in the highly static, non-renewable mammalian brain was a breakthrough in neuroscience. Most emphasis was put on the possibility to figure out new strategies for brain repair against the threath of neurodegenerative diseases. Yet, unlike lower vetebrates, which are characterized by widespread postnatal neurogenesis, neurogenic sites in mammals are highly restricted within two very small regions. Hence, the fact that protracted neurogenesis in mammals is an exception rather than the rule slowes down hopes for generalized brain repair.

Work carried out in the recent past at the University of Turin, involving Federico Luzzati and Paolo Peretto at the Department of Animal Biology, and Giovanna Ponti and Luca Bonfanti at the Department of Veterinary Morphophysiology, revealed striking examples of structural plasticity and neurogenesis in the nervous system of rabbits. These Lagomorphs show remarkable differences under the profile of neurogenesis with respect to their close relatives Rodents (mice and rats).

Now, in a work published in this week's issue of PLoS ONE and coordinated by senior author Luca Bonfanti, new neuronal progenitors were found to be produced in the cerebellum of young and adult rabbits. This is rather astonishing since the mammalian cerebellum is known as one of the most static brain regions, wherein microscopic synaptic remodelling has long been considered as the only type of plasticity.

In addition, unlike the two 'classic' neurogenic sites, the 'alternative' neurogenic sites discovered in rabbits are not remnants of embryonic germinal layers. These new cells are produced from neural progenitors localized within the mature brain parenchyma, thus representing a more widespread source of neurons and glial cells. This fact supports the emerging hypothesis that the existence of actively dividing parenchymal cell progenitors could be more interesting than stem cells located in neurogenic sites, at least for future perspectives of brain repair.

Under the functional profile, the unusual neurogenesis observed in rabbits could be related to a relatively longer lifespan of these animals, if compared to the short lived Rodents. This hypothesis opens new fields of research in humans, wherein adult neurogenic sites are known to exist, but less it is known about other regions of their large-sized brain.

Citation: Ponti G, Peretto P, Bonfanti L (2008) Genesis of Neuronal and Glial Progenitors in the Cerebellar Cortex of Peripuberal and Adult Rabbits. PLoS ONE 3(6): e2366. doi:10.1371/journal.pone.0002366 (www.plosone.org/doi/pone.0002366)

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