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Press release

Transient hyperactivity for young neurons in the adult brain

Researchers at the Institut Pasteur, in association with the CNRS, have just shown that new neurons generated in the adult brain are highly plastic at the start of their lives. Over a number of weeks they lose this feature, and become the same as all other neurons. This discovery could explain the failure of therapeutic strategies hitherto based on grafts, which deliver large quantities of new neurons – programmed to lose their special properties very quickly.

Pierre-Marie Lledo and his team in the *Perception and Memory* Unit at the Institut Pasteur (CNRS URA 2182) have just demonstrated an unexpected property of new neurons generated in the adult brain and integrated in the olfactory bulb circuit: for the first twelve weeks of their life, which is a crucial period for their integration in nerve circuits, these young cells are particularly reactive to excitation, and present increased learning capacities. This hypersensitivity is subsequently lost, and the new nerve cells, which no longer have any special function, end up with similar properties to those of preexisting neurons.

Scientists have also demonstrated that, two weeks after their formation, only 50% of these new cells succeed in integrating into neuronal circuits – an essential condition for their survival.

Consequently, only certain newborn neurons – perhaps the most active – succeed in establishing new connections. Eliminating the others would therefore enable a constant and progressive renewal of nerve cells in the olfactory bulb. This constant production of neurons, previously thought to be a substantial waste (10,000 cells produced daily are destined to die very quickly), now has a clear role – to make way for young cells.

The discovery, if it were proven for other cerebral structures, would shed light upon the difficulties currently encountered during attempts at graft treatments for

neurodegenerative diseases. In the 1990s, grafts of dopaminergic cells sourced from embryos, in patients suffering from Parkinson's disease, resulted in only a temporary recovery of motor ability. If new neurons demonstrate significant properties only for a few weeks, attempts at recovering certain cerebral functions by relying solely on the grafting of cells can never be successful. It would be better to look towards stimulating the brain's natural capacity to produce neurons continuously.

Source:

- *Neurogenesis promotes synaptic plasticity in the adult olfactory bulb*, ***Nature Neurosciences***, published online on May 3rd, 2009.

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- Mouret A, Gheusi G, Gabellec MM, de Chaumont F, Olivo-Marin JC and Lledo P-M. *Learning and survival of newly generated neurons: when time matters*. J. Neurosci. 28, 11511-16, 2008

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