NEUROGENESIS

Seeking stem cells

Recent evidence has suggested that the rostral migratory stream (RMS) — the path that is followed by neuroblasts migrating from the subventricular zone (SVZ) to the olfactory bulb (OB) — may contain its own population of neural stem cells; however, the characteristics and fate of these cells was unknown. Lledo and colleagues now show that a population of RMS astrocytes have stem-cell like properties and supply functional neurons to the OB.

The authors injected a lentiviral vector capable of infecting glia but not neurons into the RMS of adult mice. The vector encoded green fluorescent protein (GFP), allowing them to track the fate of the transduced cells. Immunostaining for cell-type markers and electron microscopy 1–2 days after injection confirmed the glial nature of the labelled cells, many of which had the characteristics of astrocytes. Twenty one days after injection, GFP+ cells were found throughout the RMS and the OB, and many of the labelled cells in the OB granule-cell layer co-expressed neuronal markers. Ninety days after injection the number of labelled OB neurons was three times higher, indicative of continual production of neurons from the population of labelled cells.

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Patch-clamp recordings in GFP+ cells in the OB 60 days after injection revealed that the cells possessed many of the electrophysiological properties of OB inhibitory interneurons. In addition, by recording inhibitory and excitatory synaptic events, the authors showed that the cells had integrated into the existing OB circuitry.

Next the authors investigated how proliferation of the RMS and SVZ stem cell populations is regulated, using BrdU labelling over a 2-week period followed by a 26-day washout period as these stem cells tend to divide slowly. Proliferation in these regions was sensitive to changes in sensory input: temporary ablation of the main olfactory epithelium increased BrdU labelling in the RMS but not the SVZ. By contrast, providing the animals with an enriched olfactory environment for 3 weeks increased BrdU labelling in both regions.

This study demonstrates that glia in the RMS can generate a significant number of inhibitory interneurons in adult mice. Moreover, it provides insight into the differential regulation of stem cell populations in the RMS and SVZ.

Katherine Whalley

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