IN BRIEF

DEVELOPMENT

A developmental compartment regulated by *Lunatic fringe* in the forebrain.

Zeltser, L. M. *et al. Nature Neurosci.* **4**, 683–684 (2001)

In a rare example of compartmentalization in the diencephalon, the authors find that *Lunatic fringe (L-fng)* is expressed throughout the developing avian forebrain, except in a wedge-shaped domain in the middle of the prosencephalon. This domain gradually narrows to form the zona limitans intrathalamica (zli), which separates the ventral and dorsal thalamus. Ectopic expression of *L-fng* can direct cells to segregate out of the zli and can disrupt its formation.

NEUROIMAGING

Nonmonotonic noise tuning of BOLD fMRI signal to natural images in the visual cortex of the anesthetized monkey.

Rainer, G. *et al. Curr. Biol.* **11**, 846–854 (2001)

Our ability to perceive a natural scene decreases monotonically as noise is added. Rainer *et al.* have measured the BOLD activity elicited in the visual cortex of anaesthetized monkeys by visual scenes with and without noise. Natural images elicited more activity than noise patterns, but intermediate levels of noise produced a V-shaped tuning curve of activity. This might reflect an interaction between the small number of neurons activated at high rates by natural scenes and the larger number of neurons activated at low rates by noise patterns.

ION CHANNELS

DEG/ENaC ion channels involved in sensory transduction are modulated by cold temperature.

Askwith, C. C. *et al. Proc. Natl Acad. Sci. USA* **98**, 6459–6463 (2001)

The search for a cold-sensitive channel continues. Some cation channels of the DEG/ENaC family, which are expressed in sensory neurons of the skin and tongue, might function as taste or mechanoreceptors. As the perception of taste and touch can change with temperature, Askwith *et al.* report that cold temperatures increase current flow through these channels by slowing desensitization.

CIRCADIAN RHYTHMS

Nonredundant roles of the *mPer1* and *mPer2* genes in the mammalian circadian clock.

Zheng, B. *et al. Cell* **105**, 683–694 (2001)

Differential functions of *mPer1*, *mPer2*, and *mPer3* in the SCN circadian clock.

Bae, K. *et al. Neuron* **30**, 525–536 (2001)

These papers describe the effects of single and double mutations of *mPer1* and *mPer2*. Either mutation disrupts the circadian period, but double-knockout mice are arrythmic. The effects of these mutations on the expression of other clock genes show that the proteins are complementary: mPER1 regulates other proteins post-transcriptionally, whereas mPER2 regulates clock gene expression.

STEM CELLS

The A to C of neuronal maturation

The finding of neuronal stem cells in the adult brain has pointed to new avenues of treatment for neurodegenerative diseases and traumatic brain injury. But realizing the clinical potential of this knowledge will depend on an understanding of the molecular mechanisms that control the fate of stem cells in the central nervous system. How is the switch from immature stem cell to mature neuron achieved? Conti and colleagues have taken an important step towards answering this question by showing that changes in the expression of Shc adaptor proteins occur as cells undergo neuronal differentiation.

Shc proteins couple activated protein tyrosine kinase receptors to downstream signalling pathways, allowing cells to respond to trophic agents such as nerve growth factor. As they report in *Nature Neuroscience*, Conti *et al.* showed that neuronal precursors differ from mature neurons in their expression of two forms of Shc. So, whereas neuronal stem/progenitor cells express ShcA, they were found to be largely devoid of ShcC. Conversely, ShcC was expressed at relatively high levels in the mature brain, unlike ShcA, which was downregulated as development progressed. In fact, ShcC was expressed only in post-mitotic neurons, apparently replacing ShcA, and its level of expression increased with brain maturation.

Conti *et al.* went on to show that ShcA, expressed in cultured neuronal progenitors, and ShcC, expressed in these cells as they differentiated, could be activated equally by the same ligands; but whereas the former supports the proliferation of neuronal precursors, ShcC was found to activate pathways that promote the survival and differentiation of post-mitotic neurons. These data indicate that the switch from ShcA to ShcC drives the transformation of progenitor cells into fully functional neurons. But what causes this shift in expression? Finding the answer to this question could be the next step in our efforts to harness the therapeutic potential of neuronal stem cells.

Rebecca Craven

References and links

ORIGINAL RESEARCH PAPER Conti, L. *et al*. Shc signaling in differentiating neural progenitor cells. *Nature Neurosci.* **4**, 579–586 (2001)

FURTHER READING Conti, L. *et al*. Expression and activation of SH2/PTB-containing ShcA adapter protein reflects the pattern of neurogenesis in the mammalian brain. *Proc. Natl Acad. Sci. USA* **94**, 8185–8190 (1997) | Alvarez-Buylla, A. *et al*. A unified hypothesis on the lineage of neural stem cells. *Nature Rev. Neurosci*. **2**, 287–293 (2001)

Stem cells (left) and differentiated neurons (right) visualized by immunofluorescence; the expression of ShcA and ShcC is balanced in these cell populations. Courtesy of Elena Cattaneo, University of Milan, Italy.