

## IN BRIEF

**NEURODEGENERATIVE DISEASE**

Reversing EphB2 depletion rescues cognitive functions in Alzheimer model

Cissé, M. *et al. Nature* 28 Nov 2010 (doi:10.1038/nature09635)

Amyloid- $\beta$  oligomers might contribute to cognitive deficits in Alzheimer's disease by impairing NMDARs (N-methyl-D-aspartate receptors). Here, the authors show that amyloid- $\beta$  oligomers bind to ephrin type B receptor 2 (EPHB2) — a receptor tyrosine kinase that regulates NMDAR function — triggering proteasomal degradation of EPHB2 *in vitro*. Knocking down EPHB2 in the mouse dentate gyrus impaired synaptic plasticity in this region, whereas EPHB2 overexpression rescued learning and memory deficits and synaptic function in a mouse model of Alzheimer's disease.

**DEVELOPMENT**

Gap junction expression is required for normal chemical synapse formation

Todd, K. L., Kristian, W. B. Jr & French, K. A. J. *Neurosci.* **30**, 15277–15285 (2010)

Gap junction-based electrical synapses establish circuits during development. These circuits resemble later circuits that involve chemical synapses. The authors used RNA interference to transiently reduce gap junction formation in single sensory neurons of the developing leech before the time at which chemical synapses normally form. This disrupted chemical synapse formation, and chemical synapses remained absent after leeches became juveniles. Thus, electrical synapses are necessary forerunners of chemical synapses.

**OLFACTION**

Effects of *in utero* odorant exposure on neuroanatomical development of the olfactory bulb and odour preferences

Todrak, T., Heth, G. & Restrepo, D. *Proc. R. Soc. Lond. B* 1 Dec 2010 (doi:10.1098/rspb.2010.2314)

The authors investigated the process underlying young mammals' preference for their mother's odour and for smells and flavours of foods that their mother experienced during pregnancy. They exposed pregnant and/or nursing mice to odorants that activate specific olfactory receptors. In the offspring, the glomeruli in which the olfactory sensory neurons expressing these olfactory receptors coalesce were larger than in control pups. This indicates that early odour exposure shapes the neuroanatomical development of the olfactory system.

**SYNAPTIC TRANSMISSION**

Presynaptic resurgent Na<sup>+</sup> currents sculpt the action potential waveform and increase firing reliability at a CNS nerve terminal

Kim, J. H., Kushmerick, C. & von Gersdorff, H. J. *Neurosci.* **30**, 15479–15490 (2010)

Following an action potential, the calyx of Held displays a depolarizing afterpotential, the mechanism of which has remained enigmatic. Here, the authors show that in the rat calyx a resurgent sodium current is responsible. This current, which was found to be expressed in early development and to increase in amplitude as the nervous system matures, conferred high precision and resilience of spike firing, and rapid recovery from inactivation — attributes crucial for efficient processing of sound stimuli.