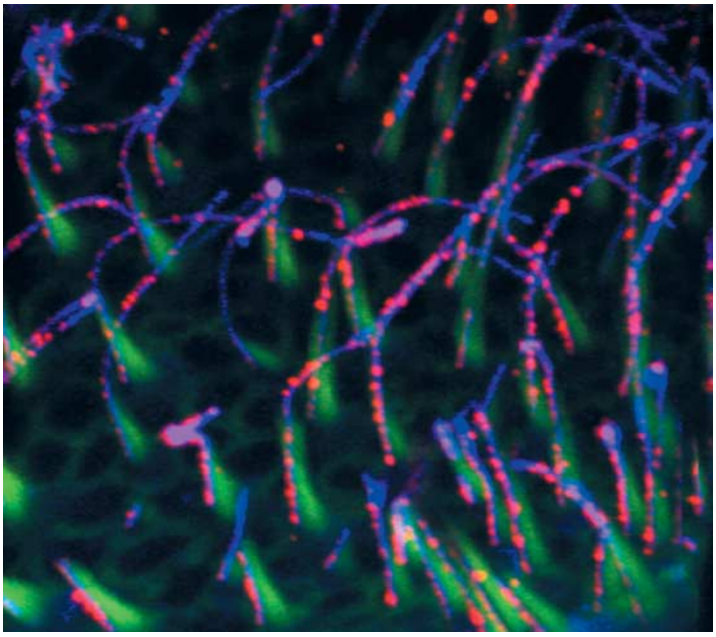

TRPA1 antibody labelling of hair cells in mouse semicircular canal. Red, TRPA1; blue, tubulin in kinocilia; green, actin in stereocilia. Image courtesy of D. Corey, Harvard Medical School, Boston, Massachusetts, USA.

conformational change that would result from channel closing might amplify the vibration of the basilar membrane in the cochlea. This 'cochlear amplifier' is believed to mediate frequency tuning. If TRPA1 turns out to represent the transduction channel, gating spring and cochlear amplifier in one, it would be a remarkable example of evolutionary ingenuity.

Rachel Jones

References and links

ORIGINAL RESEARCH PAPER Corey, D. P. *et al.* TRPA1 is a candidate for the mechanosensitive transduction channel of vertebrate hair cells. *Nature* 13 October 2004 (10.1038/nature03066)

prevent hippocampal L-LTP could be blocked by an infusion of BDNF shortly after the LTP-inducing stimulus. BDNF treatment could also change early-phase (E-)LTP, induced by a different stimulation protocol, into L-LTP.

Mice lacking the gene for either tPA or plasminogen show impaired L-LTP. The authors found that this could be rescued by treatment with BDNF, consistent with the idea that the main role of tPA in L-LTP is to generate BDNF.

Pang and colleagues also showed that, *in vitro*, plasmin cleaves proBDNF to form BDNF. Although neither plasminogen nor tPA alone could do this, when combined they were just as effective as plasmin, supporting the idea that tPA can indirectly promote proBDNF cleaveage by cleaving plasminogen to form plasmin. In addition, immunoprecipitation and immunochemistry studies showed that proBDNF is present at greater concentrations in the hippocampi, and specifically the CA1 region, of mice that lack tPA.

By testing which of tPA, plasminogen and BDNF could rescue the L-LTP deficits in mice lacking each of these three proteins, the authors showed that plasmin is downstream of tPA in the induction of L-LTP, and BDNF is downstream of both. These results might indicate that BDNF is the crucial end-product of the protein-synthesis-dependent step in L-LTP (and possibly long-term memory) induction. If that is the case, BDNF could be responsible for the structural and functional changes that are required for L-LTP.

Rachel Jones

References and links

ORIGINAL RESEARCH PAPER Pang, P. T. *et al.* Cleavage of pro-BDNF by tPA/plasmin is essential for long-term hippocampal plasticity. *Science* **306**, 487–491 (2004)

WEB SITE

Lu laboratory: http://neuroscience.nih.gov/Lab.asp?Org_ID=275

IN BRIEF

NEUROTECHNIQUE

Second harmonic imaging of membrane potential of neurons with retinal.

Nemet, B. A. *et al. J. Biomed. Opt.* **9**, 873–881 (2004)

The authors describe an optical method for imaging the membrane potential of neurons using all-*trans* retinal. When retinal is adsorbed to the neuronal plasma membrane, changes in membrane potential cause a change in its second harmonic generation that can be used to produce high-resolution images of live neurons. This study was carried out using cultured neurons, but it should be possible to extend the technique to acute brain slices.

DEVELOPMENT

Control of dendritic branching and tiling by the tricornered-kinase/furry signaling pathway in *Drosophila* sensory neurons.

Emoto, K. *et al. Cell* **119**, 245–256 (2004)

Dendritic fields are often precisely controlled so that a given territory is completely covered by the dendrites of neighbouring neurons without any overlap. Emoto and colleagues show that the tiling of sensory neuron dendrites in *Drosophila* requires two evolutionarily conserved proteins — the tricornered (TRC) kinase and Furry (FRY). Flies in which either is mutated have dendrites with excessive branching and overlap. The evidence indicates that TRC and FRY promote repulsion between like dendrites and also limit dendritic branching.

EYE MOVEMENTS

Dissociation of spatial attention and saccade preparation.

Juan, C.-H. *et al. Proc. Natl Acad. Sci. USA* **101**, 15541–15544 (2004)

It is unclear whether covert shifts in attention represent shifts in gaze that are planned but not executed, or an independent process. To address this question, Juan *et al.* measured deviations in saccades evoked by stimulation of the frontal eye fields in macaque monkeys during a pro-saccade or anti-saccade task. The results indicate that neurons in the frontal eye fields can covertly orient attention without preparing to carry out an eye movement.

SYNAPTIC PLASTICITY

Single-shock LTD by local dendritic spikes in pyramidal neurons of mouse visual cortex.

Holfhoff, K. *et al. J. Physiol.* **560.1**, 27–36 (2004)

The dendrites of pyramidal neurons in layer 5 of mouse visual cortex show a variety of spiking activity, including spatially restricted spikes that are triggered by NMDA (*N*-methyl-D-aspartate) receptor activation. The authors use two-photon and confocal imaging to investigate these spikes, and find that they involve a high-amplitude, rapid calcium transient that is restricted to a small compartment of the dendrite. A single such spike, elicted by a single synaptic stimulus, can produce local, input-specific, long-term synaptic depression.