IN BRIEF

MOLECULAR NEUROSCIENCE

Phospholipase C β 3 mediates the scratching response activated by the histamine H1 receptor on C-fiber nociceptive neurons.

Han, S.-K. *et al. Neuron* **52**, 691–703 (2006)

An itch causes an irresistible urge to scratch, but the underlying mechanisms are unclear. A new study shows that activation of the histamine 1 receptor on C-fibre sensory neurons causes an increase in intracellular calcium levels, which is mediated by the enzyme phospholipase C β 3. Mice lacking phospholipase C β 3 did not scratch when exposed to compounds that were itch-inducing in wild-type animals, including histamine. Phospholipase C β 3 is therefore required for the scratch response triggered by histamine.

FEAR AND ANXIETY

Recent fear is resistant to extinction.

Maren, S. & Chang, C. *PNAS* **103**, 18020–18025 (2006)

People having undergone a traumatic event are often offered stress debriefing sessions soon afterwards in order to prevent the development of post-traumatic stress disorder. However, the efficacy of such interventions has been debated. In a study in rats, Maren and Chang showed that early intervention did not suppress fear in the long term if animals displayed high fear levels at the start of the intervention as a consequence of the initial traumatic experience. If this finding also applies to humans, it suggests that it might be worthwhile to ensure that a person's baseline fear levels have diminished before starting debriefing sessions.

NEUROGENETICS

A polymorphism in the norepinephrine transporter gene alters promoter activity and is associated with attention-deficit hyperactivity disorder.

Kim, C.-H. *et al. PNAS* **103**, 19164–19169 (2006)

A newly discovered common A/T polymorphism in the promoter region of the norepinephrine transporter (*NET*) gene turns out to influence activity of that promoter. Only the T allele variant contains a binding site for zinc finger transcriptional regulators that repress gene transcription. Population analysis revealed that the T allele is associated with attention-deficit hyperactivity disorder, leading the authors to suggest that reduced transcription of *NET* might increase the risk for this disorder.

FUNCTIONAL NEUROANATOMY

Representation of body identity and body actions in extrastriate body area and ventral premotor cortex.

Urgesi, C. *et al. Nature Neurosci.* 10 December 2006 (doi:10.1038/nn1815)

A new study shows that one part of the brain, the extrastriate body area (EBA), is involved in discriminating body shapes, whereas another part, the ventral premotor cortex (vPMC), processes body movements. When researchers interfered with the EBA using repetitive transcranial magnetic stimulation, they found that it took individuals longer to differentiate between pictures showing two different people's hands performing the same particular action. By contrast, when the vPMC was disrupted, individuals took longer to distinguish between pictures of the same hand performing two different actions.

SYNAPTIC PLASTICITY

Rapid response maintains synaptic homeostasis

The nervous system makes use of a diverse set of mechanisms to maintain synaptic function in the face of challenges that might alter neuronal excitability, yet these homeostatic processes are not well understood. A new paper by Davis and colleagues probes synaptic homeostasis at the *Drosophila melanogaster* neuromuscular junction, revealing an unexpectedly rapid timeframe and providing new information on the mechanisms involved.

The *D. melanogaster* neuromuscular junction is a classic model for the study of synaptic homeostasis. Previous studies that have altered the response of the postsynaptic muscle cell to glutamate release from motor neuron terminals demonstrated a compensatory increase in presynaptic neurotransmitter release, which preserves muscle excitation at normal levels. These studies indicated the existence of homeostatic mechanisms that take place over several days. The new study suggests that an additional 'fast' response also contributes to synaptic homeostasis at the neuromuscular junction.

The researchers used a toxin derived from wasp venom, PhTox, to block postsynaptic glutamate receptors in a neuromuscular junction preparation. This resulted in a decrease in the amplitude of excitatory postsynaptic potentials (EPSPs) in response to motor neuron stimulation. Within 10 minutes, a compensatory increase in presynaptic quantal glutamate release was observed, accompanied by the restoration of EPSPs to close to normal levels. This suggests the involvement of a rapid homeostatic signalling process, which detects changes in the

postsynaptic response and feeds back to the presynaptic terminal within minutes.

A series of experiments were carried out to investigate the mechanisms involved in this homeostatic response. By severing the motor neuron axons innervating the preparation, the authors showed that evoked neurotransmitter release is not required, indicating that changes in the efficacy of spontaneous miniature release events, which take place in the absence of evoked transmitter release, were enough to induce the homeostatic process.

Cacophony mutants — flies with a mutation in a key subunit of a presynaptic calcium channel — did not demonstrate the same homeostatic response to PhTox, indicating that this channel is an essential component of the homeostatic signalling pathway in presynaptic terminals.

These results provide insights into homeostasis at the neuromuscular junction. Further work is needed to examine how changes in postsynaptic excitation are detected and integrated as well as the molecules involved in retrograde signalling and triggering the presynaptic response. It will be important to determine whether similar fast homeostatic responses take place in the *D. melanogaster* CNS, and in vertebrates. Acquiring such knowledge could lead to a better understanding of neurological disorders in which such homeostatic processes might be disrupted.

Katherine Whalley

ORIGINAL RESEARCH PAPER Frank, C. A. *et al.* Mechanisms underlying the rapid induction and sustained expression of synaptic homeostasis. *Neuron* **52**, 663–677 (2006).