IN BRIEF

SYNAPTIC PLASTICITY

Experience strengthening transmission by driving AMPA receptors into synapses.

Takahashi, T. *et al*. *Science* **299**, 1585–1588 (2003)

Experiments *in vitro* had shown that the glutamate receptor subunit GluR1 is incorporated into synapses as a result of plastic changes. Does the same mechanism operate *in vivo*? The authors transfected neurons of the rat barrel cortex with GluR1 and found this to be the case, but only if the whiskers were not trimmed or a segment of GluR1 that inhibits delivery of the whole protein to synapses was not co-transfected. So, GluR1 incorporation into the synapse is a mechanism, first identified in slices, which might mediate the effect of experience on the efficacy of synaptic transmission *in vivo*.

CELL BIOLOGY OF THE NEURON

The presynaptic active zone protein Bassoon is essential for photoreceptor ribbon synapse formation in the retina.

Dick, O. *et al*. *Neuron* **37**, 775–786 (2003)

Functional inactivation of a fraction of excitatory synapses in mice deficient for the active zone protein Bassoon.

Altrock, W. D. *et al*. *Neuron* **37**, 787–800 (2003)

Two papers on the function of the presynaptic protein Bassoon. In the mouse retina, Dick *et al*. found that the absence of Bassoon led to abnormalities in the formation of ribbon synapses; the presynaptic 'ribbon' is not anchored to the active zone. In the hippocampus, Altrock *et al*. found that Bassoon is not crucial for synapse formation, but its absence causes reduced transmitter release at a subset of synapses; although synaptic vesicles are docked, they seem unable to fuse.

SENSORY SYSTEMS

Combinatorial coexpression of neural and immune multigene families in mouse vomeronasal sensory neurons.

Ishii, T. et al. *Curr. Biol*. **13**, 394–400 (2003)

Functional expression of murine V2R pheromone receptors involves selective association with the M10 and M1 families of MHC class Ib molecules.

Loconto, J. *et al*. *Cell* **112**, 607–618 (2003)

Two studies showing that neurons of the basal vomeronasal organ (VNO), which express V2R pheromone receptors, also express molecules of the major histocompatibility complex (MHC). Both studies show that VNO neurons that express a given V2R receptor might express several different MHC molecules. In addition, Loconto *et al*. show that the MHC molecules form a complex with pheromone receptors and β2-macroglobulin, and might be involved in the transport of V2R receptors to the membrane. These data point to a potential role for MHC molecules in pheromone detection.

SYNAPTIC PHYSIOLOGY

Self control

Autapses are synapses that a neuron makes on itself. Although there is structural evidence for the existence of autapses in the brain, it is not clear whether and how they affect neuronal function. Now, new data in *The Journal of Neuroscience* indicate that a subset of interneurons make autaptic connections that help to sculpt inhibition in the neocortex.

Bacci *et al*. recorded from different types of interneuron in cortical slices and found that fast-spiking interneurons formed inhibitory synapses on themselves. Depolarizing a fast-spiking interneuron led to the appearance of a GABA (γ-aminobutyric acid)-mediated synaptic current on the same cell shortly after the action potential. But is this current the result of true autaptic activity? Although the short latency of the current provides a good indication of its autaptic nature, the authors reasoned that if the GABA-mediated current was elicited by autapses, then interfering with transmitter release in the same neuron should readily block it. They therefore injected the calcium chelator BAPTA into fast-spiking interneurons, causing the currents to disappear. By contrast, this manipulation did not affect GABA-mediated currents elicited by neighbouring interneurons.

What is the function of these autapses? One clue came from experiments in which Bacci *et al*. depolarized a fast-spiking interneuron twice, in quick succession, and asked whether the efficacy of the second stimulus to elicit an action potential changed when autapses were active. They found that if they blocked autaptic transmission with a GABA antagonist, the second depolarization was more effective in eliciting an action potential, indicating that autapses might provide a form of feedback inhibition in the neocortex. They also found that autaptic activity had an inhibitory effect on repetitive interneuron firing; blocking GABA-mediated transmission while the fast-spiking interneuron was made to fire repeatedly led to an increase in firing frequency.

These results show that autapses are not mere artifacts but actually shape inhibitory activity. It will now be important to investigate the implications of this new form of feedback inhibition for rhythmic activity, network oscillations and other cortical patterns of firing that involve the activity of interneurons.

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References and links

ORIGINAL RESEARCH PAPER Bacci, A. *et al*. Functional autaptic neurotransmission in fast-spiking interneurons: a novel form of feedback inhibition in the neocortex. *J. Neurosci.* **23**, 859–866 (2003)
FURTHER READING McBain, C. J. & Fisahn, A. Interneurons unbound. *Nature Rev. Neurosci.* **2**, 11–23 (2001)