This Week in The Journal

Cellular/Molecular

Receptor-Laden Exocytic Vesicles Can Rapidly Fuse and Reform

Damien Jullié, Daniel Choquet, and David Perrais

(see pages 11106–11118)

Whether a neuron responds to extracellular signals such as guidance molecules, neurotrophins, and neurotransmitters depends on the amount and location of receptors for the signals in the neuron's plasma membrane. These are regulated by ongoing endocytosis, recycling, and exocytosis. Endocytosis of AMPA receptors, for example, reduces responses to presynaptic glutamate release, whereas reinserting the receptors via exocytosis increases synaptic strength. After insertion into the plasma membrane, receptors can either diffuse rapidly within the membrane (called "burst" exocytosis) or remain clustered at the insertion point ("display" exocytosis). Using pH-sensitive fluorescent molecules to track protein movements, Jullié et al. found that transferrin, glutamate, and adrenergic receptors underwent both types of exocytosis. Moreover, receptors that underwent display exocytosis were often locally reinternalized within a few seconds, suggesting the fusion pore rapidly opened and closed. Reinternalized receptors often remained near the plasma membrane for several seconds before they were exocytosed in either burst or display events or their fluorescence faded as the endosome acidified.

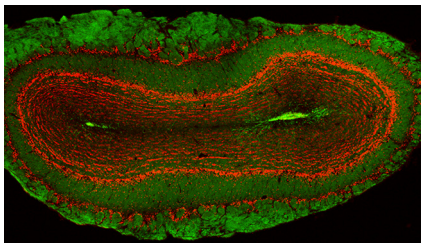
Development/Plasticity/Repair

Fate of Adult-Born Human SVZ Neuroblasts Remains Unclear

Congmin Wang, Yan You, Dashi Qi, Xing Zhou, Lei Wang, et al.

(see pages 10906–10923)

The hypothesis that new neurons are generated in adult brain first gained wide acceptance in the late 1990s. It is now generally agreed that neurons are continually produced in the hippocampus and the subventricular zone (SVZ) of adult rodents. The extent to which neurogenesis occurs in adult humans remains controversial, however. In particular, although neuroblasts are present in adult human SVZ, newborn neurons are rare in the adult olfactory bulb, the destination of SVZ neuroblasts in rodents. A recent study suggested newborn neurons from adult human SVZ become striatal interneurons, but Wang et al. dispute this finding. They found few cells expressing the neuroblast marker doublecortin in the SVZ and none in the striatum or olfactory bulb of adult humans. Furthermore, whereas most doublecortin-labeled cells coexpressed the lineage marker Sp8, <1% of striatal interneurons did. Conversely, most somatostatin-expressing striatal interneurons—but no doublecortin-labeled neuroblasts—coexpressed the marker Sox6. Finally, studies using BrdU showed no evidence of newborn neurons in the striatum of adult monkeys.



Most mature interneurons and neuroblasts (green) in the adult rhesus monkey olfactory bulb express Sp8 (red), indicating they were derived from the lateral ganglionic eminence. Very few striatal interneurons express this transcription factor, instead expressing markers that indicate they were derived from the medial ganglionic eminence. See the article by Wang et al. for details.

Systems/Circuits

Subthalamic Nucleus Slows Reactions to Unlikely Events

Chrystalina A. Antoniades, Rafal Bogacz, Christopher Kennard, James J. FitzGerald, Tipu Aziz, et al.

(see pages 10844–10852)

Reaction times are influenced by expectations. In saccade tasks, for example, reaction times are shorter when targets appear in a likely position and longer when targets appear in an unlikely position. The subthalamic nucleus (STN), a part of the basal ganglia thought to inhibit unwanted actions, has been proposed to influence reaction times. One model posits that the STN weights possible actions so that as the need for one action becomes more likely, the probability that alternative actions will be suppressed increases. If this hypothesis is correct, Antoniades et al. reasoned, disrupting STN activity should disrupt this normalization process. In the absence of STN deep brain stimulation, Parkinson's disease patients performed like controls on a probabilistic saccade task. Although reaction times still decreased for likely targets when the stimulator was turned on, reaction times did not increase for unlikely targets. This suggests that separate neural mechanisms underlie increases and decreases in reaction times and that the STN contributes to the former.

Behavioral/Cognitive

Explicit and Implicit Memory May Be Linked

Christopher J. Berry, Roy P. C. Kessels, Arie J. Wester, and David R. Shanks

(see pages 10963–10974)

It is widely believed that separate systems exist for storing explicit and implicit memory. The strongest evidence for this model comes from people with temporal lobe damage who do not consciously recognize images presented during a previous session (that is, their explicit memory is impaired), yet they are better able to decipher degraded versions of these images than of new images (that is, they benefit from repetition priming, a type of implicit memory). Berry et al. previously proposed a model in which a single memory system underlies recognition and repetition priming. This model predicts that (1) deficits in recognition will be accompanied by deficits in priming, (2) items that are recognized will exert a greater priming effect than unrecognized items, and (3) the overall priming advantage will be greater than the priming advantage for unrecognized old versus new items. The authors now present evidence to support this model based on tests in amnesic patients with Korsakoff's syndrome.