This Week in The Journal

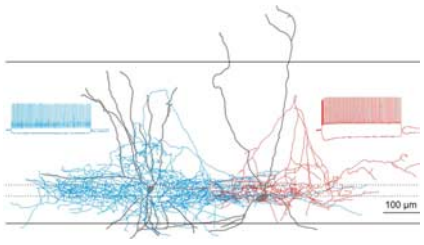
● Cellular/Molecular

Actions of Cannabinoids and Opioids in Inhibitory Networks

Lindsey L. Glickfeld, Bassam V. Atallah, and Massimo Scanziani

(see pages 1824–1832)

Hippocampal pyramidal neurons receive somatic inhibitory inputs from two types of basket cells—regular spiking (RS) and fast spiking (FS) cells—that are active at different times. Both cannabinoids and opioids act presynaptically to reduce this inhibition, but as shown by electrophysiological experiments in rat slice cultures by Glickfeld et al., the actions of cannabinoids and opioids are largely restricted to different classes of basket cells. Cannabinoid receptor (CB1R) agonists acted solely on RS cells, reducing their inhibition of pyramidal cells and of other RS cells. In contrast, μ-opioid receptor (μOR) agonists primarily reduced pyramidal cell inhibition by FS cells, but they also reduced inhibition mediated by some RS cells, suggesting that the segregation of the two receptor types is not complete. Both agonists reduced polysynaptic inhibition of pyramidal cells evoked by stimulation of Schaffer collaterals, but the timing of the effects suggested that CB1Rs reduced feedback inhibition, whereas μORs reduced feedforward inhibition.



Reconstructions of an FS (left; blue, axon; gray, dendrite) and an RS (right; red, axon; gray, dendrite) basket cell. Insets, Voltage traces from the cells shown in response to depolarizing and hyperpolarizing steps. See the article by Glickfeld et al. for details.

▲ Development/Plasticity/Repair

Effects of Prenatal Alcohol Exposure on GABAergic Neurons

Verginia C. Cuzon, Pamela W. L. Yeh, Yuchio Yanagawa, Kunihiko Obata, and Hermes H. Yeh

(see pages 1854–1864)

The adverse effects of excessive alcohol consumption during pregnancy are clearly seen in fetal alcohol syndrome, but even small doses can be damaging. This week, Cuzon et al. report that chronic exposure to low levels of ethanol (producing a blood alcohol content three times lower than that defining legal intoxication in the United States) resulted in accelerated migration and differentiation of cortical GABAergic interneurons in embryonic rats. Whole-cell electrophysiological recordings in cortical slices detected elevated GABA levels and increased sensitivity of GABAergic neurons to GABA in ethanol-exposed embryos. Blocking GABA receptors prevented ethanol-induced acceleration of migration, whereas bath application of GABA increased migration in control slices, suggesting that the effects of ethanol are mediated through GABA signaling. Although more GABAergic interneurons were present in the cortex at embryonic day 14 in ethanol-exposed rats, previous studies suggest that many of these neurons must die, because adult brains of ethanol-exposed embryos have fewer GABAergic neurons than controls.

■ Behavioral/Systems/Cognitive

Sensory Processing in the Trigeminal Nucleus

Takahiro Furuta, Elena Timofeeva, Kouichi Nakamura, Keiko Okamoto-Furuta, Masaya Togo, Takeshi Kaneko, and Martin Deschênes

(see pages 1789–1797)

The vibrissal system of rodents, which is used to navigate and to recognize objects, has been intensively studied in the somatosensory barrel cortex and the thalamus. In contrast, little is known about neural interactions in the first sensory-processing stage, the trigeminal nuclei. Neurons in the principal trigeminal nucleus (PrV) respond to movement of single or multiple whiskers and are inhibited by movements of adjacent whiskers. Although receptive field size and surround inhibition have been thought to arise from connections between trigeminal subnuclei, evidence for this has remained elusive. Now Furuta et al. have used lesions, electrophysiological recordings, tract tracing, *in situ* hybridization, and electron microscopy to show definitively that PrV receives GABAergic projections from the interpolaris subnucleus and glutamatergic inputs from the caudalis subnucleus. Ablating inputs from interpolaris eliminated surround inhibition of PrV neurons, providing strong evidence that intersubnuclear connections shape the ascending output of trigeminal nuclei.

♦ Neurobiology of Disease

Eliminating Brain Tumors with Viruses

Koray Özduman, Guido Wollmann, Joseph M. Piepmeier, and Anthony N. van den Pol

(see pages 1882–1893)

Viral targeting may become the first effective treatment for glioblastoma, if the approach presented by Özduman et al. continues to hold promise. Previous attempts that used nonreplicating viruses to attack gliomas failed because the infected area remained small. These authors therefore used a replicating vesicular stomatitis virus to target expansive tumor implants in mice. A single intravenous injection of virus successfully and simultaneously infected multiple tumors within and outside the brain. Several different types of tumors were infected, whereas normal cells were almost completely spared. By fluorescently labeling both tumor and viruses, the authors could observe the progress of infection through a cranial window. Initial infection occurred focally, but as the virus replicated, infected cells died and the infection quickly spread to encompass the entire tumor. Infection of some migrating tumor cells suggested that viral treatment may prove effective against infiltrating tumors as well.