This Week in The Journal

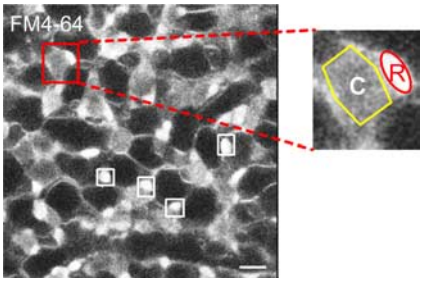
● Cellular/Molecular

Rods, Cones, and Dark Calcium

Zejuan Sheng, Sue-Yeon Choi, Ajay Dharia, Jian Li, Peter Sterling, and Richard H. Kramer

(see pages 5033–5042)

Rods and cones differ in their sensitivity and responses to light. Sheng et al. used comparative "retinology" to address these differences in tokay geckos, anole lizards, and salamanders. In the dark, rods and cones are depolarized and tonically release synaptic vesicles until light suppresses release. But rods, which signal under low light conditions, release quanta in a slow drip compared with the faster flow from cones. The authors visualized release of fluorescently labeled synaptic vesicles with two-photon microscopy in the rod-only (and nocturnal) retina of the tokay gecko and found a slower release rate compared with the previously reported rates in the cone-only retina of the anole lizard. In salamander retina, the authors compared rods and cones by measuring dye-loading rates and again found slower release in rods. Calcium-sensitive dyes revealed the underlying culprit: in the dark, intraterminal calcium level in rods was about half that in cones.



A salamander retina, loaded with FM4-64, shows different patterns of cone (C) and rod (R) terminal labeling as shown in the enlarged panel at right. See the article by Sheng et al. for details.

▲ Development/Plasticity/Repair

Dlx/Dlx2 Enhancers and Interneuron Subtypes

Noël Ghanem, Man Yu, Jason Long, Gary Hatch, John L. R. Rubenstein, and Marc Ekker

(see pages 5012–5022)

In this week's *Journal*, Ghanem et al. examined the regulation of *Dlx* homeobox gene expression in the development of GABAergic interneurons. The author focused on the cis regulatory elements (CREs) I12b, I56i, and the newly identified URE2 on expression of *Dlx1/Dlx2* and *Dlx5/Dlx6*. Using reporter gene expression, the authors show distinct spatiotemporal activity of these CREs on *Dlx* expression in the lateral (LGE), medial (MGE), and caudal (CGE) ganglionic eminences of the developing telencephalon. Tangentially migrating interneurons in early development could be distinguished according to the expression of different CREs. The authors provide a picture of overlapping influences of these CREs. These patterns also persisted into adulthood, as mature cortical interneurons showed differential CRE activity. Because of sequence differences between the CREs, they likely bind different combinations of transcription factors.

■ Behavioral/Systems/Cognitive

Breathing, Coughing, and Sneezing Neurons

Keisuke Shiba, Ken Nakazawa, Kenichi Ono, and Toshiroh Umezaki

(see pages 5156–5162)

In addition to their function during breathing, laryngeal muscles are multifunctional, also controlling vocalization and airway protective behaviors like coughing. In this week's *Journal*, Shiba et al. examined whether the central pattern generators (CPGs) underlying these functions involved common premotor neurons. Expiratory neurons with an augmenting firing pattern (EAUGs) are inhibitory premotor neurons of the laryngeal adductor muscle. The authors made simultaneous extracellular recordings of EAUGs and intracellular recordings from laryngeal motoneurons in anesthetized cats. During fictive breathing, coughing, or sneezing, evoked by electrical or mechanical stimulation, EAUG neurons fired repeatedly during expiration as well as the expulsive phases of coughing and sneezing. Throughout swallowing, however, the cells were silent. Thus, EAUG neurons as members of the respiratory network also contribute to several patterned behaviors that converge on the same laryngeal motor neurons. Swallowing, however, is apparently a matter for other premotor neurons.

◆ Neurobiology of Disease

CHIPing Away at SBMA

Hiroaki Adachi, Masahiro Waza, Keisuke Tokui, Masahisa Katsuno, Makoto Minamiyama, Fumiaki Tanaka, Manabu Doyu, and Gen Sobue

(see pages 5115–5126)

Spinal and bulbar muscular atrophy (SBMA) is caused by expansion of the polyglutamine (polyQ) repeat in the androgen receptor (AR) gene. As a result, motor neurons die. Misfolded mutant proteins also accumulate in the nucleus associated with components of the ubiquitin-proteasome system and molecular chaperones. This week, Adachi et al. tracked a so-called quality-control ligase that is associated with the mutant-AR inclusions. C terminus of Hsc70-interacting protein (CHIP) ubiquitinates and degrades wild-type AR and can suppress inclusions in other polyQ disease models. CHIP overexpression in cultured cells led to a significant decline in mutant AR as a result of enhanced degradation and ubiquitination. Endogenous CHIP colocalized with mutant AR in neurons of SBMA model mice (AR-97Q) and in patients with SBMA. Overexpression of CHIP in normal mice caused no apparent developmental or motor impairment. However, in AR-97Q mice, overexpression of CHIP reduced the motor and histological features of SBMA.