This Week in The Journal

● Cellular/Molecular

Airflow Rate Alters Odor Sensitivity

Yuki Oka, Yoshiki Takai, and Kazushige Touhara

(see pages 12070–12078)

The sensitivity of olfactory glomeruli to odors *in vivo* is much greater than the sensitivity of odor receptors *in vitro*, probably because airborne odorants become concentrated in the olfactory mucosa when an animal actively sniffs. Sniffing involves increases in respiration frequency as well as increases in airflow rate within the nasal cavity. The former has been found to improve odor discrimination, but according to Oka et al., only airflow rate affects sensitivity. The authors tested several odorants that varied in functional groups, polarity, and molecular weight and found the effects of airflow depended on the odorant: increased airflow increased sensitivity for some and decreased or did not change sensitivity for others. The effects of airflow were greatest at odorant concentrations that were near detection threshold at normal breathing rate. Because the airflow effects were odorant-dependent, the pattern of responses in the olfactory bulb to complex combinations of odors varied with airflow rate.

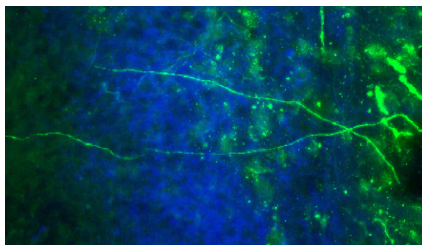
▲ Development/Plasticity/Repair

Propriospinal Axons Appear to Grow Through Lesions

Keith K. Fenrich and P. Ken Rose

(see pages 12145–12158)

Long-range projecting axons in the spinal cord do not regenerate after injury because axons lose the ability to grow as they mature and because growth-inhibiting molecules are present in the lesion environment. Attempts to overcome these problems have had limited success and have generally failed to produce significant functional recovery. Increasing evidence suggests that propriospinal interneurons are more resilient to injury than other neurons, that their axons sprout after partial lesion, and they can contribute to functional recovery. Fenrich and Rose report that the axons of cervical commissural interneurons in cat spinal cord regenerated through the inhibitory environment of a midline lesion and formed functional synapses with contralateral motor neurons. Identifying the molecular mechanisms that enable these regenerating axons to grow in the inhibitory lesion area might provide clues that could lead to the development of treatments to promote regeneration of other CNS axons.



Regenerating propriospinal neurons (green) grow through a lesion site, despite the presence of inhibitory chondroitin sulfate proteoglycans (blue). See the article by Fenrich and Rose for details.

■ Behavioral/Systems/Cognitive

Microsaccade-Induced Neural Activity Affects EEG

Olaf Dimigen, Matteo Valsecchi, Werner Sommer, and Reinhold Kliegl

(see pages 12321–12331)

Microsaccades, the small, rapid, involuntary eye movements that occur during visual fixation, are essential for overcoming adaptation and maintaining perception of stationary objects. They might also increase spatial resolution and sensitivity to edges. Microsaccades typically occur at 1–2 Hz; their frequency decreases immediately after a visual target appears, then transiently rebounds to above baseline. Previous studies have indicated that activation of muscles controlling microsaccades produces an electrical spike that can resemble gamma-frequency oscillations in the human EEG. Dimigen et al. demonstrate that microsaccades also produce neuronal activity measurable as an EEG response centered over visual cortex and similar to that produced by larger saccades. Microsaccades occurred in most trials of a target-counting task, and the latency to and frequency during poststimulus rebound varied with the number of targets. Importantly, microsaccade-induced cortical activity differentially affected visual event-related potentials at different electrodes and microsaccade rates, indicating that microsaccades can confound interpretation of EEG results.

♦ Neurobiology of Disease

Hsp70 ATPase Inhibitors Reduce Tau

Umesh K. Jinwal, Yoshinari Miyata, John Koren III, Jeffrey R. Jones, Justin H. Trotter, et al.

(see pages 12079–12088)

Several neurodegenerative diseases are caused by abnormal processing and/or folding of the microtubule-associated tau. Proper folding is regulated by molecular chaperone proteins, including the heat shock protein Hsp70. Evidence suggests that Hsp70 can limit progression of protein-folding diseases and reduce inappropriate tau stability in Alzheimer's disease (AD). Jinwal et al. therefore sought to identify inhibitors and activators of Hsp70 ATPase activity that might effectively regulate tau. Unexpectedly, Hsp70 ATPase inhibitors significantly decreased, whereas activators increased, the levels of tau and phosphorylated tau in cell lines expressing human tau. Moreover, inhibitors decreased tau levels and AD-associated hyperphosphorylation in brain slices and *in vivo* in mice expressing a human tau mutation. Transient increases in Hsp70 levels enhanced the ability of the ATPase inhibitor to reduce tau levels. These results suggest that when Hsp70 ATPase activity is blocked (thus preventing protein refolding), the misfolded protein is shuttled more efficiently into the proteasome system and degraded.