This Week in The Journal

● Cellular/Molecular

Lipid Rafts and the Assembly of Paranodes

Dorothy P. Schafer, Rashmi Bansal, Kristian L. Hedstrom, Steven E. Pfeiffer, and Matthew N. Rasband
(see pages 3176–3185)

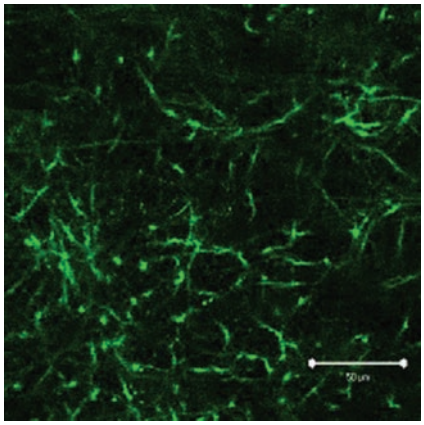
Myelin improves axonal conduction properties not only by passively insulating axons but also by participating in the clustering of voltage-gated ion channels at nodes of Ranvier. The paranode represents the front line between axonal cell adhesion molecules such as Caspr and contactin and oligodendroglial proteins such as neurofascin-155 (NF-155). This week, Schafer et al. report that as paranodes form, a fraction of NF-155 meets the biochemical criteria for incorporation into lipid rafts, membrane microdomains consisting of an amalgam of protein and lipid components. Raft-associated NF-155 was not seen in premyelinating oligodendrocytes in culture, suggesting that an extrinsic signal is needed to place NF-155 in lipid rafts. Likewise, mutant animals with impaired paranodes attributable to deficient galactolipid synthesis also lacked raft-associated NF-155. The authors suggest that paranode formation results from interaction of NF-155 with its axonal ligand, which in turn stabilizes NF-155 in a lipid raft opposing the axonal Caspr/contactin cell adhesion complex.

▲ Development/Plasticity/Repair

Imaging CA1 Pyramidal Cells In Vivo

Adi Mizrahi, Justin C. Crowley, Eran Shtoyerman, and Lawrence C. Katz
(see pages 3147–3151)

Experience and neuronal activity alter the strength of connections between neurons. Such synaptic plasticity is associated with functional, biochemical, and structural changes. Although changes in dendritic spine morphology have been correlated with conditions such as an enriched environment, whether new spines or changes in spines are responsible for synaptic plasticity remains controversial. In this issue, Mizrahi et al. present an *in vivo* method for tracking the structural plasticity of hippocampal dendritic spines. They took advantage of a transgenic mouse in which a subset of hippocampal pyramidal neurons expresses green fluorescent protein (GFP). After removing the overlying cortex, they used two-photon laser scanning microscopy to visualize basal dendritic trees in stratum oriens of the dorsal hippocampus, the most superficial and thus accessible region of the hippocampus. Perhaps surprisingly, spines were remarkably stable for several hours, even after induction of epileptic seizures. This general approach offers the promise of resolving the contribution of structural changes to synaptic plasticity in real time.



A series of 49 images at 2.5 μm increments showing GFP-positive basal dendrites and cell bodies in the CA1 region *in vivo*. The movie begins at the axonal sheets of the cingulum bundle and ends at the pyramidal cell body layer.

■ Behavioral/Systems/Cognitive

Singing and Talking with FoxP

Ikuko Teramitsu, Lili C. Kudo, Sarah E. London, Daniel H. Geschwind, and Stephanie A. White

Sebastian Haesler, Kazuhiro Wada, A. Nshdejan, Edward Morrisey, Thierry Lints, Eric D. Jarvis, and Constance Scharff
(see pages 3152–3175)

A seemingly disparate group of vertebrates (humans, dolphins, whales, bats, and songbirds) shares the trait of learned vocalization. Recently, a monogenetic speech disorder was traced to a mutation in *FoxP2*, one of a family of four "forkhead box" transcription factors not previously implicated in brain function. Language function in the index family could not be attributed to sensory or intellectual deficits or problems with articulation, suggesting that the gene was directly related to language. Two reports in this week's *Journal* suggest that *FoxP2* may contribute to vocal learning. Haesler et al. compare the spatially and temporally variable expression of *FoxP2* in zebra finch learners and non-learners. The vocal learners expressed *FoxP2* in the song circuit in a pattern that varied with song learning and seasonality. Meanwhile, Teramitsu et al. examined the *in situ* expression of *FoxP2* and *FoxP1* and found remarkably similar patterns between humans and zebra finches. Interestingly, *FoxP1*, but not *FoxP2*, showed sexual dimorphic expression in songbirds. One gets the feeling we are going to hear a lot more about this story.

♦ Neurobiology of Disease

Seizures and Glutamate Transporters

Michael Demarque, Nathalie Villeneuve, Jean-Bernard Manent, Hélène Becq, Alfonso Represa, Yehezkel Ben-Ari, and Laurent Aniksztejn
(see pages 3289–3294)

Glutamate transporters are expressed early in development, suggesting that their function may extend beyond recycling of free transmitter at mature synapses. This week, Demarque et al. address this question using the broad-spectrum glutamate transporter blocker DL-threo-β-benzyloxyaspartate (TBOA). In neocortical slices from neonatal rats, the inhibitor induced network-driven slow oscillations and intracellular calcium fluctuations. The activity was blocked by an NMDA receptor antagonist and was mimicked by bath application of NMDA. However, tetrodotoxin and AMPA receptor antagonists also blocked the oscillations, indicating that NMDA receptors were necessary but not sufficient. *In vivo*, injections of TBOA produced NMDA receptor-dependent seizures in postnatal day 5 pups. Because TBOA is not transported, and therefore does not increase glutamate release by reverse transport, the authors conclude that seizure activity arose solely from block of glutamate uptake. The authors suggest that disruption of glutamate transporters could contribute to epileptic syndromes in infants.