This Week in The Journal

● Cellular/Molecular

Drosophila Are Grounded without $InsP_3$ Receptors

Santanu Banerjee, Jisue Lee, K. Venkatesh, Chun-Fang Wu, and Gaiti Hasan
(see pages 7869–7878)

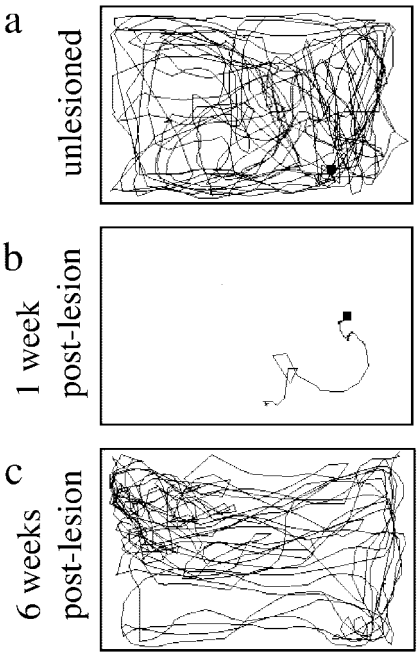
When inositol trisphosphate ($InsP_3$) binds its receptor, calcium from intracellular stores floods the cytosol. From worms to humans, this vital second messenger is so ubiquitous that animals lacking the normal receptor gene *itpr* rarely survive. However, some heterozygous mutants provide clues to specific $InsP_3$ signaling functions. This week, Banerjee et al. show in *Drosophila* mutants that flight is among the complex behaviors reliant on $InsP_3$. Heterozygous *itpr* mutant flies were flightless. A transgene for the $InsP_3$ receptor rescued flight. Although abnormal wing posture accompanied several of the flightless mutants, rescue of the wing conformation itself did not confer flight. Rescue of $InsP_3$ in aminergic interneurons with tissue-specific drivers was sufficient to get the flies airborne again, suggesting that the $InsP_3$ receptor regulates flight by modulating serotonin release. This linkage of molecule with behavior likely involves both an effect on development as well as altered neuronal activity in the adult.

▲ Development/Plasticity/Repair

A Zebrafish L1 Homolog in Regeneration

Catherina G. Becker, Bettina C. Lieberoth, Fabio Morellini, Julia Feldner, Thomas Becker, and Melitta Schachner
(see pages 7837–7842)

Regeneration of spinal axons is easy for the adult zebrafish but sadly deficient in mammals. Expression of the cell adhesion molecule L1 is generally correlated with regenerative success, but it only appears in mammalian axotomized central neurons when axons are within a permissive peripheral nerve graft. The fish homolog L1.1 is upregulated after spinal transection and is thought to aid in the robust axon regeneration and functional recovery of zebrafish spinal axons. In this issue, Becker et al. used morpholinos (stable, modified antisense RNAs) to knock down L1.1 expression in zebrafish. After spinal cord transection, morpholinos were taken up and transported to the cell body. Neuronal L1.1 expression was specifically reduced in morpholino-treated fish, even after 6 weeks. Without L1.1, brainstem neurons did not regenerate spinal axons or form functional synapses, and normal constant swimming behavior was nearly abolished. The homophilic and heterophilic binding capacity of L1 makes it quite a versatile contributor to regeneration.



The videotaped images show the swim track of a zebrafish before complete spinal cord transection (*a*); at 1 week after transection, showing loss of swimming (*b*); and 6 weeks later, showing significant recovery (*c*). The records track movement during a 5 min trial. See the article by Becker et al. for details.

■ Behavioral/Systems/Cognitive

Getting the Attention of Motion-Sensitive Neurons

Erik P. Cook and John H. R. Maunsell
(see pages 7964–7977)

Attention, when measured at the single-cell level in the visual system, is manifest as an increase in action potentials when attention is directed to the receptive field of that neuron. In this week's issue, Cook and Maunsell examine how attention affects temporal integration on single neurons in the middle temporal (MT) area. Two highly trained monkeys performed a motion detection task under two different attentional states. The authors generated a motion stimulus using frames of a random dot pattern placed either in the receptive field of the neuron or on the opposite side of the fixation point. Data were expressed as "kernels," representing the relationship between global motion of the stimulus and the direction, speed, and time of the response. For cells that had robust responses to the motion stimulus, attention modulated the response function without a shift in the time or shape of the response. Thus their results suggest that attention increases the sensitivity of neurons without affecting the temporal characteristics of the response.

♦ Neurobiology of Disease

JNK Signaling after Ischemia

Shuzo Okuno, Atsushi Saito, Takeshi Hayashi, and Pak H. Chan
(see pages 7879–7887)

After ischemia, the c-Jun N-terminal protein kinase (JNK) pathway may be an early step leading to neuronal apoptosis via mitochondrial apoptosis-related proteins. For those for which there seem to be too many proteins involved in apoptosis, a bit of oversimplified background. Proapoptotic proteins of the Bcl-2 family, such as Bax, can be activated by BH3-only proteins, such as Bim, resulting in Bax integration into the outer mitochondrial membrane, formation of channels, release of cytochrome *c*, and apoptotic cell death. Now Okuno et al. trace these steps in a rat model of transient focal ischemia to see whether JNK could jumpstart this death cascade. After a 60 min occlusion of the middle cerebral artery, neurons in the ischemic zone expressed phosphorylated JNK and also were TUNEL-stained, suggesting that they were apoptotic. A selective inhibitor of JNK reduced apoptosis in the ischemic core, blocked interactions between JNK, BimL, and Bax, and blocked the translocation of Bax from the cytoplasm to mitochondria.