This Week in The Journal

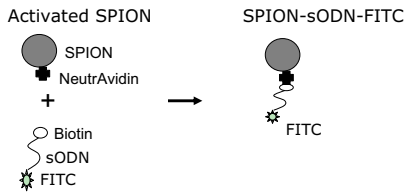
● Cellular/Molecular

Detecting mRNAs by MRI

Christina H. Liu, Young R. Kim, Jia Q. Ren, Florian Eichler, Bruce R. Rosen, and Philip K. Liu

(see pages 713–722)

To develop strategies for measuring gene expression *in vivo*, Liu et al. coupled oligonucleotides to superparamagnetic iron oxide nanoparticles (SPIONs), the latter being a sensitive contrast agent for magnetic resonance imaging. SPIONs are detectable as a signal reduction in T2-weighted magnetic resonance images. The authors infused the brains of mice with single-stranded phosphorothioate-modified oligodeoxynucleotides (sODNs) coupled to SPIONs by conjugation of avidin and biotin. An sODN conjugate complementary to c-*fos* mRNA was retained in some brain regions *in vivo* consistent with binding to c-*fos* mRNA as confirmed by detection of intracellular iron oxide by Prussian blue staining or ODN by fluorescein isothiocyanate labeling. Retention was not seen with unconjugated SPION. After stimulation with amphetamine, SPION–c-*fos* labeling increased in the forebrain, particularly in the nucleus accumbens in a pattern consistent with Fos expression patterns after acute amphetamine stimulation. Although hurdles remain, such methods offer new possibilities for assays of gene transcription.



Fluorescein isothiocyanate (FITC)–sODN–biotin was conjugated to SPION–NeutrAvidin to generate SPION–sODN probes for imaging mRNAs *in vivo*. See the article by Liu et al. for details.

▲ Development/Plasticity/Repair

An RNA-Binding Protein and the Stability of AChE Transcripts

Julie Deschênes-Furry, Kambiz Mousavi, Federico Bolognani, Rachael L. Neve, Robin J. Parks, Nora I. Perrone-Bizzozero, and Bernard J. Jasmin

(see pages 665–675)

Deschênes-Furry et al. this week provide evidence for post-transcriptional control of neuronal acetylcholinesterase (AChE) mRNA levels after axotomy. The authors examined AChE levels in the HuD4 line of transgenic mice that expresses high levels of HuD, a human RNA-binding protein. HuD, which has transcript-stabilizing activity, interacted with AChE mRNA *in vivo*, and the hippocampus of transgenic mice had twice as much AChE transcript as wild-type mice. In neurons from the rat superior cervical ganglia (SCGs), axotomy caused a dramatic decline in AChE mRNA levels over several days because of reduced mRNA stability. HuD stabilized AChE mRNA by binding specifically with the AU-rich element of the 3′-untranslated region. Accordingly, expression of HuD also dropped *in vivo* with axotomy and correlated with the decline in AChE mRNA levels. Viral expression of exogenous human HuD in SCG neurons prevented the axotomy-induced decline in AChE mRNA.

■ Behavioral/Systems/Cognitive

The Perception of Heading and MSTd

Christopher R. Fetsch, Sentao Wang, Yong Gu, Gregory C. DeAngelis, and Dora E. Angelaki

(see pages 700–712)

Visual and vestibular cues contribute to the perception of heading, or one's direction of self-motion. In this week's *Journal*, Fetsch et al. probed neurons of the dorsal subdivision of the medial superior temporal area (MSTd), a possible integration station for these signals. They asked: what is the spatial reference frame for signals represented in MSTd? The authors used a three-dimensional virtual reality system in which they presented monkeys with visual or vestibular cues separately while recording from individual MSTd neurons. The authors then computed a displacement index for each neuron according to the shift in its tuning function upon visual, vestibular, or combined stimulation. Neurons in the visual condition largely used an eye-centered reference frame, and vestibular tuning was largely head centered, whereas some neurons represented heading in an intermediate frame of reference. The evidence suggests that a common frame of reference is not required for neurons to process multisensory information.

♦ Neurobiology of Disease

The Good and the Bad Aβ

Jungsu Kim, Luisa Onstead, Suzanne Randle, Robert Price, Lisa Smithson, Craig Zwizinski, Dennis W. Dickson, Todd Golde, and Eileen McGowan

(see pages 627–633)

Amyloid β42 (Aβ42) has gotten most of the attention in Alzheimer's disease (AD), yet Aβ40 is the predominant form produced and can accumulate in AD. Although studies have searched for a villainous role for Aβ40, it just might do more good than harm. This week, Kim et al. examined mice that overexpressed Aβ40 or Aβ42 peptides but not amyloid precursor protein. The authors crossed hemizygous BRI-Aβ40 mice, which express Aβ40 but not Aβ42, with hemizygous APPswe (Tg2576) mice. BRI-Aβ40 mice did not develop pathology, even at 20 months of age. Unexpectedly, the BRI-Aβ40/Tg2576 mice fared far better than Tg2576 mice in terms of Aβ deposition. BRI-Aβ42A mice developed amyloid deposits at ~3 months and pathology at ~12 months. Bitransgenic BRI-Aβ40/BRI-Aβ42 mice had larger soluble brain Aβ but dramatically lower amyloid deposition. It was not all good news, however, because the bitransgenic mice died prematurely compared with either singly transgenic line.