This Week in The Journal

● Cellular/Molecular

Regenerative Axon Growth in Normal Mice

Oswald Steward, Binhai Zheng, Marc Tessier-Lavigne, Maura Hofstadter, Kelli Sharp, and Kelly Matsudaira Yee

(see pages 6836 – 6847)

The corticospinal tract of mice exhibits some regenerative growth without any therapeutic manipulation, according to Steward et al. After complete transection of the dorsal column, a few axons appeared to grow past the lesion via the ventral column. Axons extended from the gray matter rostral to the injury into the white matter of the ventral column, grew past the lesion, then reentered the gray matter and arborized caudal to the lesion. These were unlikely to be spared ventral corticospinal axons because the authors never saw such axons in unlesioned mice. Furthermore, unlike what would be expected for spared axons, the axons found in the ventral column after lesion were contralateral to the injected cortex, followed a circuitous route, had numerous varicosities, and were not observed rostral or caudal to the level of the lesion. This previously undescribed growth should be considered in future studies of regeneration.

▲ Development/Plasticity/Repair

Plastic Synaptic Clustering

Thomas J. McBride, Adrian Rodriguez-Contreras, Angela Trinh, Robert Bailey, and William M. DeBello

(see pages 6960 – 6973)

Functional connections between neurons might be strengthened by decreasing the distance between coactive synapses, allowing supralinear summation of inputs. This week, McBride et al. present evidence that this type of plasticity occurs in owls reared wearing prismatic goggles. Sound localization in owls depends on space-specific neurons in the inferior colliculus, and when owls are raised wearing prisms, the inputs to these neurons are sculpted to maintain proper spatial representation. McBride et al. found that the distance between axodendritic contacts (potential synapses) on individual dendritic branches was lowest in the region where the auditory spatial receptive field corresponded to the normal visual receptive field. When owls were prism-adapted, the clustering of synapses shifted: clustering decreased in the normal region and increased in the region corresponding to the displaced visual field. The number of synapses was constant across regions and conditions, suggesting that new contacts formed while others were eliminated.

■ Behavioral/Systems/Cognitive

Disruption of Human Speed Perception with TMS

Declan J. McKeefry, Mark P. Burton, Chara Vakrou, Brendan T. Barrett, and Antony B. Morland

(see pages 6848 – 6857)

Repetitive transcranial magnetic stimulation (TMS) over the cortical motion-sensitive areas V5/MT or V3a disrupts speed perception in humans. McKeefry et al. used blood oxygenation level-dependent (BOLD) responses to functionally map visual areas and to position a TMS coil, and then delivered TMS pulses at different times relative to the presentation of visual stimuli. Subjects discriminated the relative speed of drifting gratings or the spatial frequency of stationary gratings. TMS over V5/MT or V3a, but not over adjacent areas or V1, decreased the perceived speed of gratings and increased the discrimination threshold, consistent with the idea that TMS suppresses signals. Perceptual slowing was proportional to the intensity of the stimulation and was greatest when TMS coincided with presentation of the grating. In contrast, TMS of V5/MT or V3a did not affect spatial frequency discrimination. The results provide evidence of task- and location-specific effects of TMS, and suggest that V3a, like V5/MT, has a prominent role in motion perception.

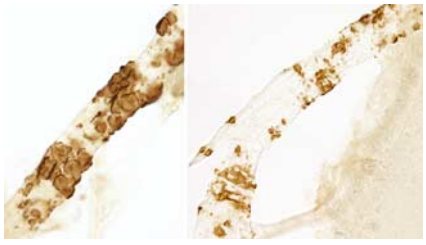
◆ Neurobiology of Disease

Immunotherapy for Alzheimer's Disease

Sally Schroeter, Karen Khan, Robin Barbour, MinhTam Doan, Ming Chen, Terry Guido, Davinder Gill, Guriqbal Basi, Dale Schenk, Peter Seubert, and Dora Games

(see pages 6787– 6793)

Passive immunization with anti-amyloid antibodies could be a valuable treatment for Alzheimer's disease (AD), but optimizing specificity and efficacy while minimizing side effects—particularly microhemorrhaging—has been challenging. This week, Schroeter et al. provide evidence that the challenges might eventually be overcome. They injected PDAPP mice (which normally develop AD-like amyloid deposits) with two antibodies targeting different amyloid epitopes, starting at 12 months of age and continuing for 6 months. Antibody 3D6, which recognizes the N terminal, prevented and/or cleared vascular and parenchymal amyloid deposits, whereas antibody 266, which recognizes a central portion of the protein, had no effect. Higher doses of 3D6 resulted in fewer amyloid deposits but also increased microhemorrhaging, which colocalized with points of amyloid clearance. Nonetheless, a moderate antibody dose prevented and/or cleared most vascular deposits without causing microhemorrhaging. These results suggest that clearing deposits without causing damage is possible, particularly if immunotherapy is started before plaque formation is extensive.



Vascular amyloid appears as rounded masses in an unaffected leptomeningeal vessel (top), but it has a patchy, eroded appearance during partial clearance triggered by immunotherapy (bottom). See the article by Schroeter et al. for details.