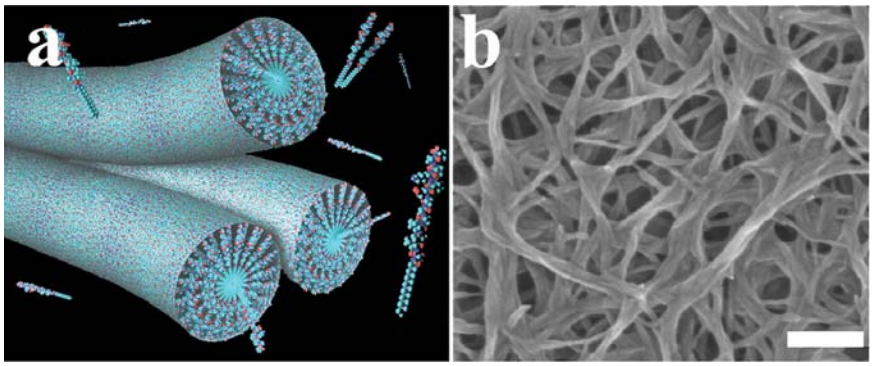
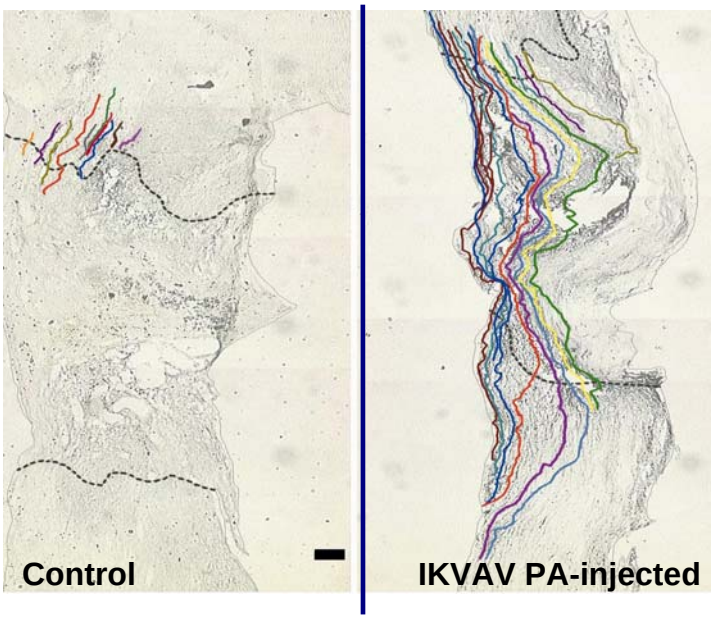
## Bioactive Nanostructures for Neural Regeneration

Spinal cord injury (SCI) often leads to permanent paralysis and loss of sensation below the site of injury because of the inability of damaged axons to regenerate in adults. Nanomaterials built from a family of self-assembling molecules may offer hope for treating serious injuries such as spinal cord injury, according to new results from Northwestern University chemistry professor Samuel Stupp and colleagues. Recently, the group has developed peptide amphiphile (PA) molecules that self-assemble *in vivo* into supramolecular nanofibers and has tested them on mouse models of spinal cord injury. In this work, *in vivo* treatment with the PA nanofibers after SCI reduced cell death and promoted regeneration of both motor fibers and sensory fibers through the lesion site. Treatment with the PA also resulted in significant behavioral improvement. These observations demonstrate that it is possible to inhibit glial scar formation and to facilitate regeneration after SCI using bioactive three-dimensional nanostructures displaying high densities of neuroactive epitopes on their surfaces.




*a) Schematic showing individual molecules assembled into nanofiber bundles to produce IKVAV PA. b) Scanning electron micrograph showing the network of nanofibers in vitro.*

*IKVAV PA promotes regeneration of motor axons after spinal cord injury. The dotted lines demarcate the borders of the spinal cord crush lesion. All descending fibers in the control group stopped at or near the edge of the lesion, whereas 40% of the axons in the IKVAV PA-injected group grew through the injured area.*




## References/Publications

Tysseling-Mattiace, Vicki ; Sahni, Vibhu; Niece, Krista L; Birch, Derin; Czeisler, Catherine; Fehlings, Michael G; Stupp, Samuel I; Kessler, John A. Self-assembling nanofibers inhibit glial scar formation and promote axon elongation after spinal cord injury. *J Neurosci*. 2008 Apr 2;28(14):3814-23.