

Supplemental Figure Legend(s)

Supplemental Figure 1: Characterization of IKVAV PA1 and IKVAV PA2. a, MALDI-TOF mass spectra of PA1 (left) and PA2 (right). The peaks at -30 and -60 from the parent peak in both cases are apparently due to the loss of $\text{CH}_2=\text{OH}()$ from the serine side chains. b, ^1H -NMR spectra of PA1 (left) and PA2 (right), taken in dTFA to minimize aggregation. The region from ppm 0-6 is magnified for visibility. The region above 6 is empty except for aromatic peaks due to the pyrenyl protons, which appear in the spectrum of PA1, and small broad peaks from exchangeable amide protons in both spectra.

Supplemental Figure 2: Characterization of the gel using atomic force microscopy and rheological data. a, Atomic force microscopy image showing IKVAV PA1 (Palmitoyl-IKVAV PA fibers) in gelled state. The individual fibers, about 7 nm in width, can be seen in this image along with a partial fiber network. b-d Rheological data for PA1 and PA2 (Pyrene-IKVAV PA or fluorescent IKVAV PA gel). The data shown are taken at 4.22 Hz and 3% strain, which falls in the linear viscoelastic regime for all three PAs. Error bars are 1 standard deviation. b, Complex modulus. PA1 and PA2 varieties are comparable in stiffness. c, Complex viscosity. The PA2 variety has somewhat less resistance to flow after

gelation than PA1. d, Damping factors (G''/G') for the two PAs. Both materials gelled ($G''/G' < 0.2$) with the addition of DMEM.

Supplemental Figure 3: Structure of IKVAV peptide amphiphile (PA)

a, Transmission electron microscope images showing the network of nanofibers. Scale bar: 100 nm. b, The chemical structure of the PAs used in these studies. The peptide sequence, SLSLAAAEIKVAV, is terminated at the N-terminus with a palmitoyl tail (PA1) or a pyrenebutyl tail in the fluorescent version (PA2).

Supplemental Figure 4: Low magnification image of an injured spinal cord 11 weeks post injury stained for GFAP in red (b) and Hoechst nuclear stain in blue (a). The merged picture is shown in c. On the right the same images have a dotted line indicating the centre of the lesion where infiltrating cells (note the high nuclear density in this region) have been compacted by the surrounding astrocytes. We have defined this area to be the "lesion area". Note that this area is largely unstained for GFAP and that the peak GFAP immunofluorescence is immediately adjacent to this area. The intensity of GFAP was quantified in the area of peak intensity as described in Methods.

Supplemental Figure 5: Effects of IKVAV-PA differ from those of

IKVAV peptide *in vitro*. Postnatal day 1 neural progenitor cells (NPCs) were derived and cultured as previously described (Silva et al, 2004) on IKVAV-PA, laminin, IKVAV peptide, or poly-D-lysine (PDL) for 1 and 7 days. Astrocyte numbers were significantly decreased (* $P < 0.02$, ** $P < 0.01$) in the IKVAV-PA group compared to all other groups by ANOVA. The effects of IKVAV-PA peptide differ strikingly from those of IKVAV peptide alone.

Supplemental Figure 6: GFAP immunofluorescence levels in the IKVAV PA-injected and control animals were normalized to normal, uninjured spinal cord. The levels in the IKVAV group are significantly reduced compared to control (* $p < 0.015$, ** $p < 0.03$ by t test).

Supplemental Figure 7: Low power images of the serial 20 μm thick brightfield sections used to trace the representative axon shown in Figures 7 and 8. The low power images provide orientation and demonstrate the benefit of Neurolucida tracing of the tortuous fiber tracts. The numbers on the sections indicate the sites of the higher power images shown in Figures 7 and 8. Note that the fibers traversing

the lesion weave through the tissue and can be present twice in one section. Scale bar:100 um