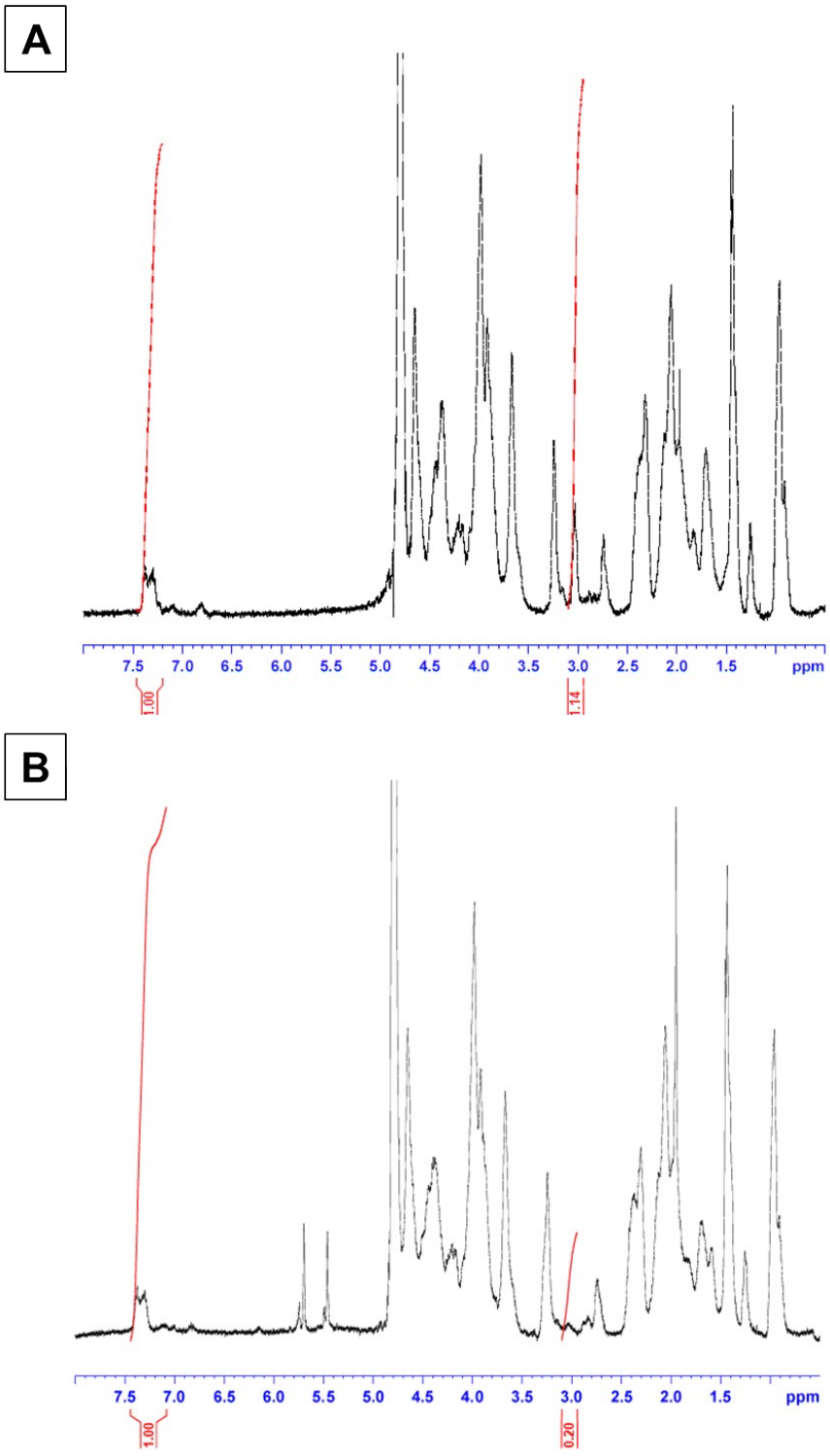
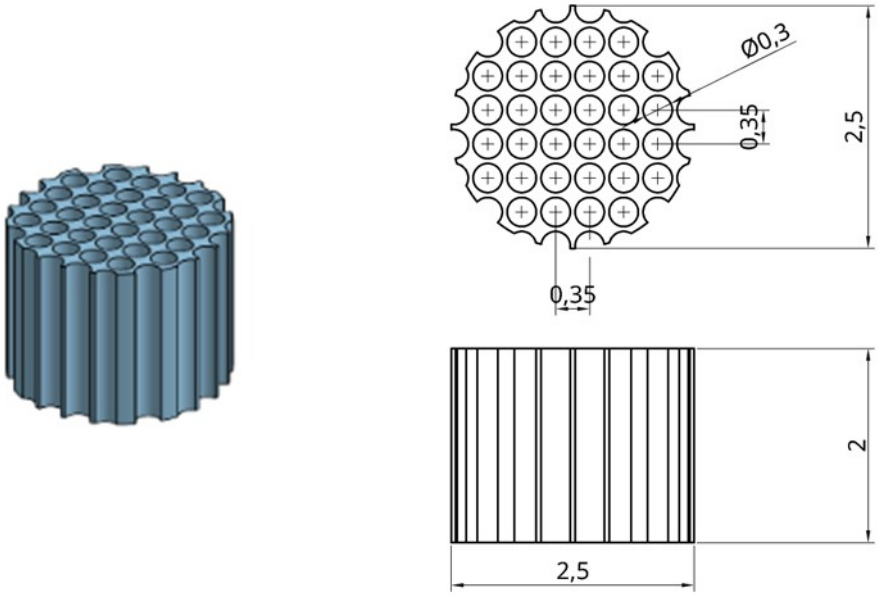
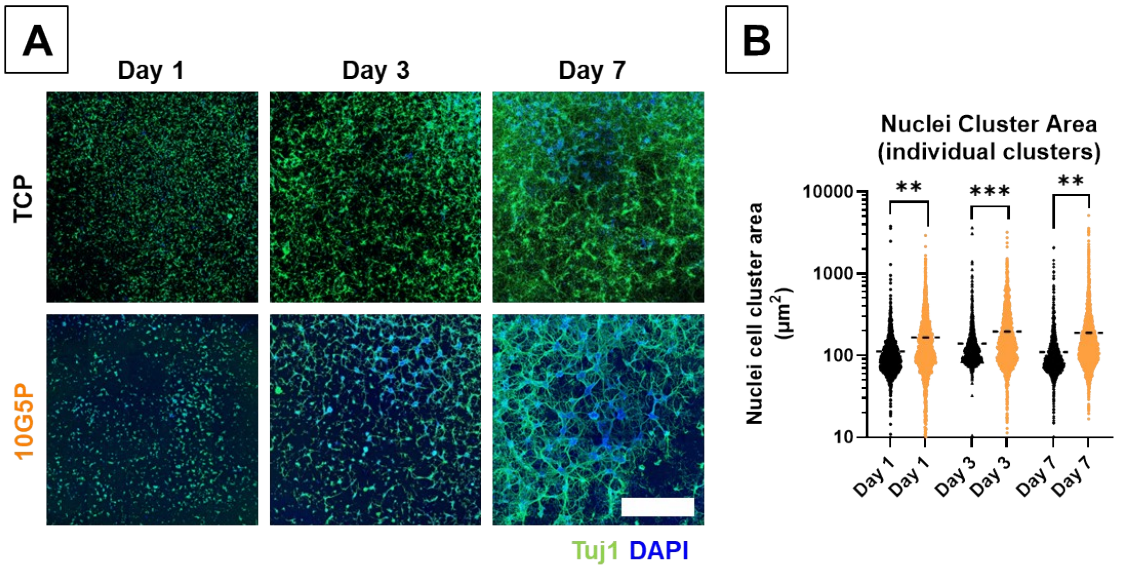
Supplementary information



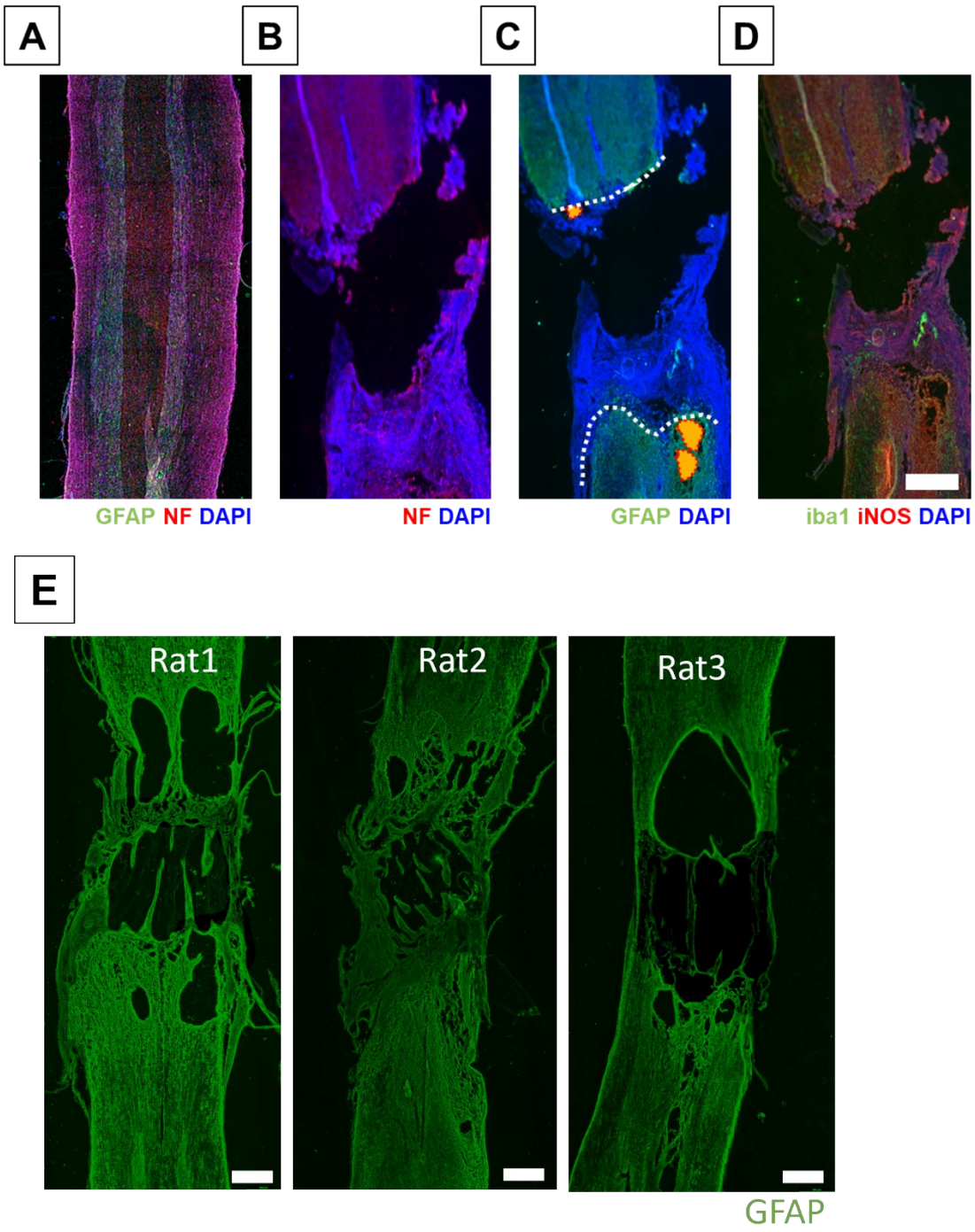
Supplementary Figure S1. NMR spectra of (A) gelatin and (B) GelMA.



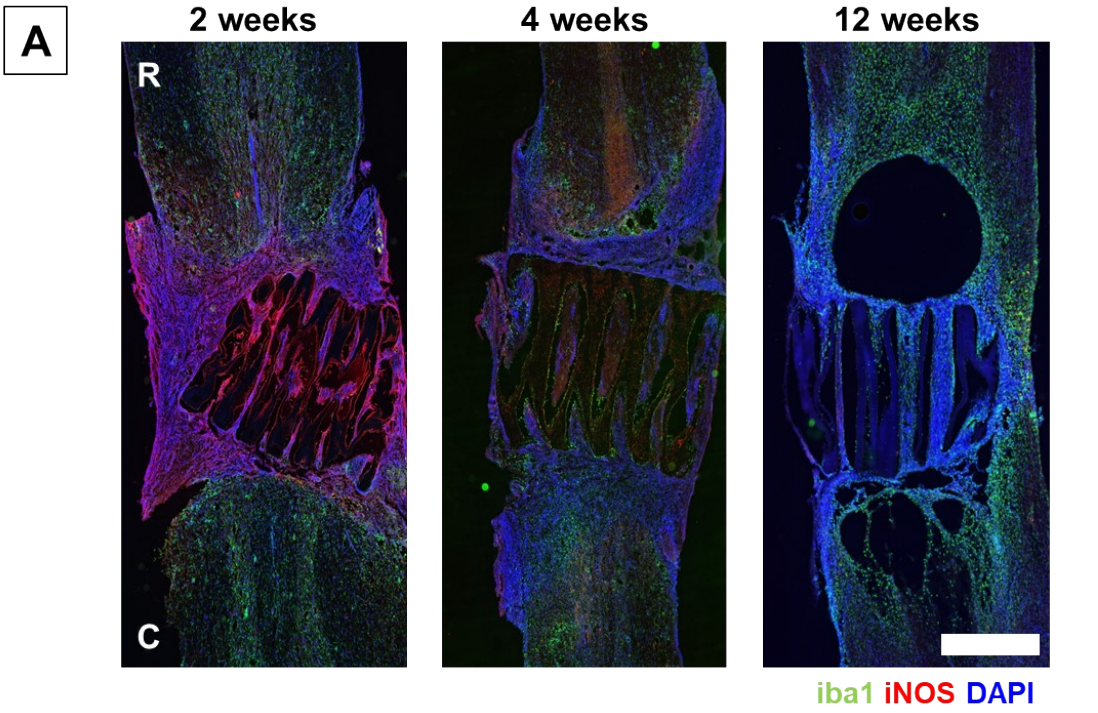
Supplementary Figure S2. CAD drawing of microchannel-containing hydrogel scaffold. Dimensions are in mm.

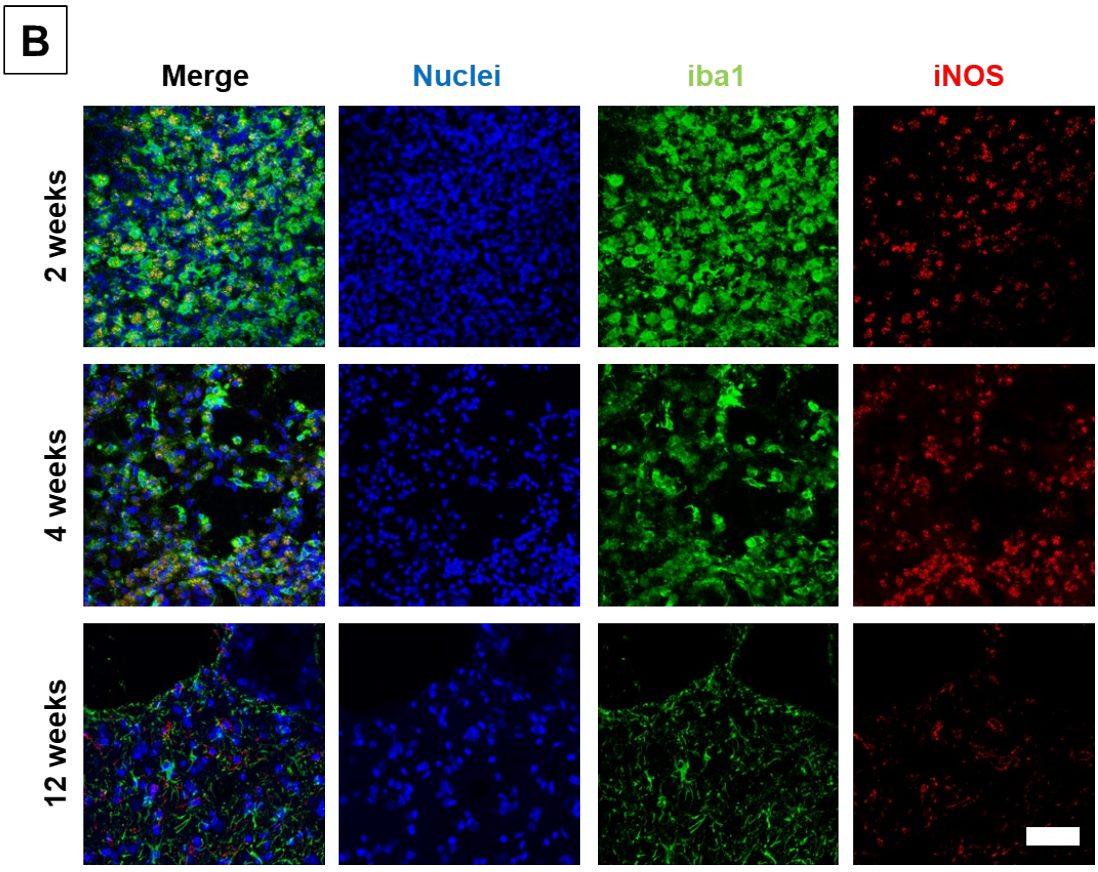


Supplementary Figure S3. (A) Gross confocal microscopy images of primary rat cortical neuron adhesion and spreading on GelMA-PEGDA scaffolds. White scale bar is 1 mm. (B) Neuronal cell cluster formation on GelMA-PEGDA scaffolds over 7 days.



Supplementary Figure S4. Gross microscopy images of (A) Intact spinal cord from sham rats at 3 months. (B) Neuronal infiltration, (C) astrocytic response, and (D) microglial response towards injured and untreated rats at 3 months after complete spinal cord transection. White dotted lines in (C) denote the beginning of the glial scar. Yellow areas around the scaffold-tissue interface denote cyst formations. (E) illustrates the integration of the spinal cord tissue with the implanted scaffold in the three rats that were studied over a period of up to 12 weeks. Scale bar is 1 mm.





Supplementary Figure S5. (A) Gross microscopy images of microglia response towards GelMA-PEGDA scaffolds *in vivo* over 3 months in a rat complete spinal cord transection model. Scale bar is

1 mm. (B) Magnified microscopy images of the rostral or caudal region of the scaffold-implant interface from (A) taken using confocal microscopy. Scale bar is 100 µm.

Supplementary Video 1:

The video file "Scaffold 12 weeks" shows the hindlimb movement of a rat implanted with GelMA-PEGDA scaffolds following rat complete spinal cord transection at 12 weeks post-implantation. The video file "Untreated 12 weeks" shows the hindlimb movement of the untreated control rat with no scaffold implantation following spinal cord transection at 12 weeks post-implantation.