Supplementary Information

A Dual-layered Microfluidic System for Long-term Controlled In Situ Delivery of Multiple Anti-inflammatory Factors for Chronic Neural Applications.

Laura Frey, Praveen Bandaru,Yu Shrike Zhang, Kevin O'Kelly*, Ali Khademhosseini*, Su Ryon Shin*

Table S1. Drug delivery profile of each test condition for 1 week study (Fig. 4).

Name	NC		DEX&DEX+		IL-4		DEX&IL-4+		IL-4&IL-4+	
Delivery Profile	DEX	IL-4	DEX	IL-4	DEX	IL-4	DEX	IL-4	DEX	IL-4
Day 0	–	–	+	–	–	+	+	–	–	+
Day 3	–	–	+	–	–	–	–	+	–	+
Day 7	–	–	+	–	–	–	–	+	–	+
Day 10	–	–	+	–	–	–	–	+	–	+

Table S2. Astrocyte model testing conditions varying % PI and duration of UV radiation.

UV (s)	Concentration of PI (%)		
	0.1	0.3	0.5
10	Too weak	Too weak	Too weak
20	Too weak	Too weak	Assess Cell Growth
30	Too weak	Assess Cell Growth	Assess Cell Growth
40	Too weak	Assess Cell Growth	Assess Cell Growth

Table S3. Drug delivery profile of each test condition for 3 week study (Fig. 5).

Name	NC		DEX&DEX+		IL-4		DEX&IL-4+		IL-4&IL-4+	
Delivery Profile	DEX	IL-4	DEX	IL-4	DEX	IL-4	DEX	IL-4	DEX	IL-4
Day 0	–	–	+	–	–	+	+	–	–	+
Day 3	–	–	+	–	–	–	–	+	–	+
Day 7	–	–	+	–	–	–	–	+	–	+
Day 10	–	–	+	–	–	–	–	+	–	+
Day 14	–	–	+	–	–	–	–	+	–	+
Day 17	–	–	+	–	–	–	–	+	–	+

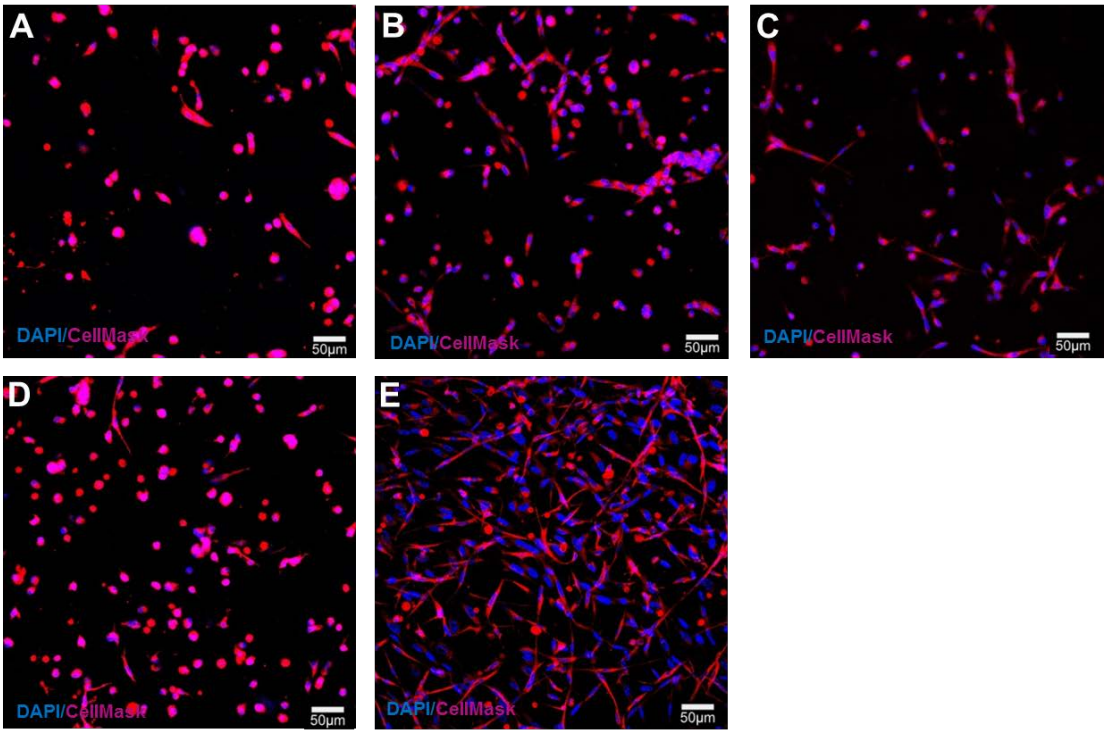

Figure S1. Confocal stacks of astrocytes after 1 week of culture in a 5% GelMA hydrogel structure with varying % PI and UV radiation exposure: A) 20s UV/ 0.5% PI; B) 40s UV / 0.5% PI; C) 30s UV/ 0.5% PI; D) 40s UV/ 0.3% PI; E) 30s UV / 0.3% PI. DAPI staining (blue) for nuclei and Cell Mask 649 (red) for astrocytes cell structure.

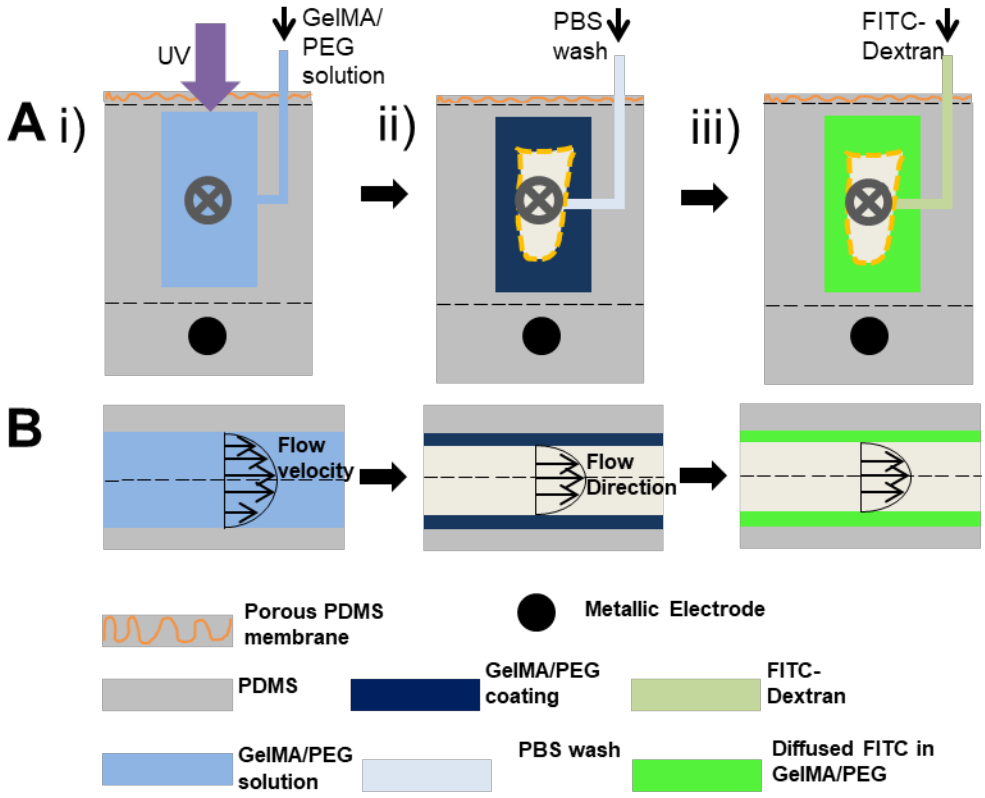

Figure S2. Schematic of the coating procedure. A) i) GelMA/PEG solution is flown through the microchannel while being to exposed to UV light for crosslinking. ii) The uncrosslinked prepolymer is washed with PBS, while the crosslinked hydrogel layer remains inside the channel and coats the PDMS channel walls. iii) FITC-dextran (20-kDa M_W) is flown though the microchannel. B) Top-view of the microchannel.

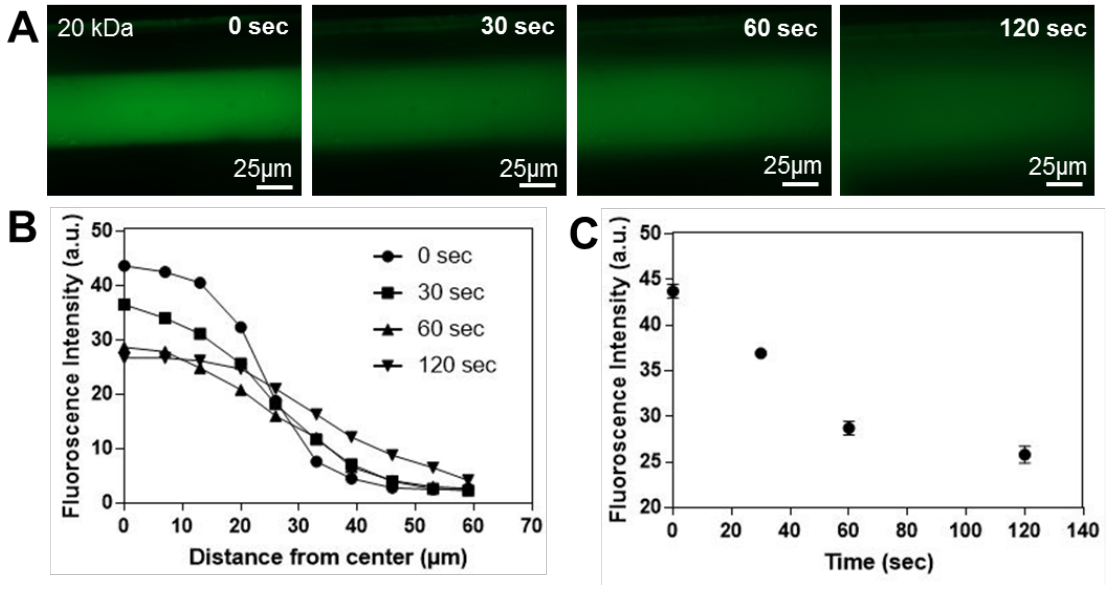

Figure S3. The 14% GelMA hydrogel coated thin dual-layered microfluidic device integrated on a metal probe. A) Fluorescence images showing the diffusion of FITC-dextran (20-kDa M_W) at different time points. B) Quantification of fluorescence intensities measured from the middle to the side along its radius of the microchannel at different time points. C) Time-lapse fluorescent signal change at a point 30μm from in the middle of the microchannel.