

Supporting Information

Magnetothermal Heating Facilitates Cryogenic Recovery of Stem Cell-Laden Alginate-Fe₃O₄ Nanocomposite Hydrogels

Xiaozhang Zhang, Gang Zhao, Yuan Cao, Zeeshan Haider, Meng Wang, Jianping Fu**

Movie Captions

Movie S1. Recovery of CPA #1 solution in plastic straw by conventional water bath at 37 °C

Movie S2. Recovery of cell-laden alginate–Fe₃O₄ nanocomposite hydrogels in CPA #2 solution without MTH

Movie S3. Recovery of cell-laden alginate–Fe₃O₄ nanocomposite hydrogels in CPA #2 solution with MTH

Movie S4. Cryomicroscopy study of CPA #1 solution during cooling and warming

Movie S5. Cryomicroscopy study of CPA #1 solution with 0.1% (w/v) Fe₃O₄ NPs during cooling and warming

Movie S6. Cryomicroscopy study of CPA #1 solution with 0.5% (w/v) Fe₃O₄ NPs during cooling and warming

Movie S7. Cryomicroscopy study of alginate hydrogel during cooling and warming

Movie S8. Cryomicroscopy study of alginate hydrogel with 0.1% (w/v) Fe₃O₄ NPs during cooling and warming

Movie S9. Cryomicroscopy study of alginate hydrogel with 0.5% (w/v) Fe₃O₄ NPs during cooling and warming

Movie S10. Cryomicroscopy study of combination of CPA #1 solution, alginate hydrogel and 0.1% (w/v) Fe₃O₄ NPs during cooling and warming

Movie S11. Cryomicroscopy study of combination of CPA #1 solution, alginate hydrogel and 0.5% (w/v) Fe₃O₄ NPs during cooling and warming

Supplementary Tables

Table S1. Cytotoxicity of alginate-Fe₃O₄ nanocomposite hydrogels with different concentrations at 0.05, 0.1 and 0.5% (w/v) for 0.5, 1 and 2 h at 4 °C.

Group	Viability (%) (Mean ± SD, n)		
	0.5 h	1 h	2 h
Fresh	96.5±1.8 (3)	95.9±1.3 (3)	94.8±2.3 (3)
0.05% NCs	95.9±2.4 (3)	95.0±1.3 (3)	93.9±1.2 (3)
0.1% NCs	95.1±1.8 (3)	94.6±2.2 (3)	93.7±1.9 (3)
0.5% NCs	94.8±1.7 (3)	92.2±3.7 (3)	91.2±2.3 (3)

Table S2. Cell viability of unencapsulated and encapsulated MSCs without or with MTH.

Group	Viability (%) (Mean ± SD, n)	
	W/O Encap	W/ Encap
Fresh (Control)	98.8±0.6 (4)	
W/O MTH	16.9±4.5 (4)	72.1±3.8 (4)
W/ MTH, 15 A	35.8±3.0 (4)	82.8±5.2 (4)

Table S3. Cell viability of encapsulated MSCs with MTH by nanocomposite hydrogels under different current intensities.

Group	Viability (%) (Mean ± SD, n)		
	0.05% NCs	0.1% NCs	0.5% NCs
5 A	70.1±3.1 (4)	73.6±3.0 (4)	72.7±4.2 (4)
15 A	73.0±3.6 (4)	75.9±5.0 (4)	82.8±5.2 (4)
20 A	72.7±4.2 (4)	75.8±3.7 (4)	78.3±4.5 (4)

Table S4. Cell viability of MSCs encapsulated in 0.05% nanocomposite hydrogels with MTH by nanoparticles in CPA solution under different current intensities.

Group	Viability (%) (Mean \pm SD, n)		
	0.05% NPs	0.1% NPs	0.5% NPs
Fresh (Control)		98.7 \pm 0.8 (4)	
W/O MTH		98.7 \pm 0.8 (4)	
5 A	71.0 \pm 4.6 (4)	72.1 \pm 4.9 (4)	71.9 \pm 2.4 (4)
15 A	73.4 \pm 4.0 (4)	77.2 \pm 5.1 (4)	84.6 \pm 3.7 (4)
20 A	72.6 \pm 3.8 (4)	74.3 \pm 5.4 (4)	76.1 \pm 4.1 (4)

Table S5. Viability of MSCs without or with MTH after proliferation for 24, 48 and 72 h.

Group	Viability (Mean \pm SD, n)		
	24 h	48 h	72 h
Fresh	1 \pm 0.03 (4)	1.61 \pm 0.03 (4)	3.05 \pm 0.06 (4)
W/O MTH	1 \pm 0.03 (4)	1.60 \pm 0.01 (4)	2.99 \pm 0.14 (4)
W/ MTH	1 \pm 0.06 (4)	1.61 \pm 0.02 (4)	3.01 \pm 0.11 (4)