

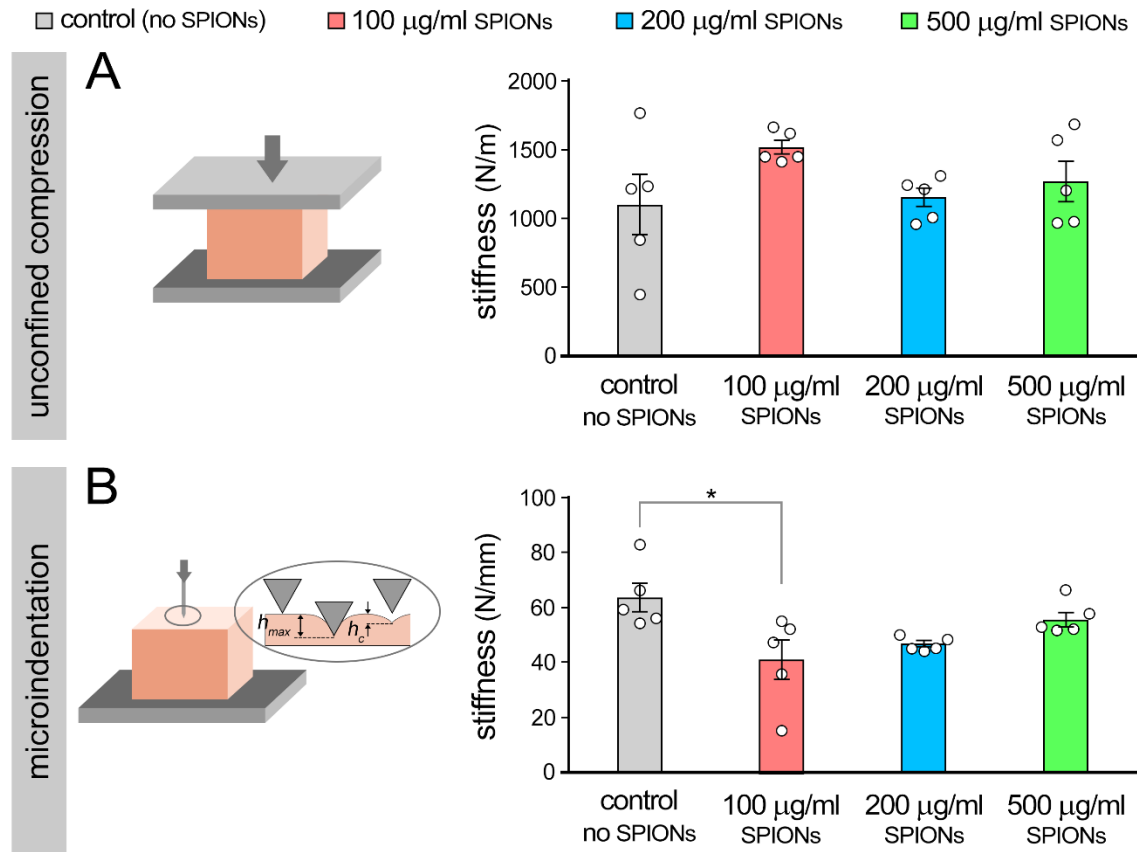
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## **Supplemental information**

### **3D bioprinting of nanoparticle-laden hydrogel scaffolds with enhanced antibacterial and imaging properties**

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## Figures



**Figure S1. Mechanical testing of bioprinted scaffolds loaded with varying concentrations of superparamagnetic iron oxide nanoparticles (SPIONs).** **A:** Unconfined compression test conducted (at a 50% total strain at 20  $\mu\text{m/s}$ ) on bioprinted GelMA scaffolds containing no SPIONs (control), 100, 200, and 500  $\mu\text{g/mL}$  SPIONs ( $n = 4$  per group). Stiffness values were calculated from the slope of the force-displacement curves at the initial 0-20% interval. **B:** Microindentation tests were conducted on GelMA constructs using a 500  $\mu\text{m}$  probe, with a depth of 100  $\mu\text{m}$  at 2  $\mu\text{m/s}$  ( $n = 5$  per group). Stiffness values were calculated based on the force-displacement unloading curves as described in Methods. \* p-value < 0.05, \*\* p-value < 0.01.

## Tables

**Table S1.** List of structural fidelity measurements conducted for the 3D bioprinted SPION-laden scaffold groups in this study. Raw values (average  $\pm$  standard deviation) of each parameter is presented.

	$D_r$ (mm)	$UC_r$ (mm)	$\alpha_r$ ( $^\circ$ )	$A_r$ (mm <sup>2</sup> )
<b>CAD model</b>	0.30	9.00	60.00	1.00
<b>0 <math>\mu\text{g/mL}</math> SPIONs</b>	1.19 $\pm$ 0.15	0.98 $\pm$ 0.02	0.95 $\pm$ 0.07	1.64 $\pm$ 0.10
<b>100 <math>\mu\text{g/mL}</math> SPIONs</b>	1.13 $\pm$ 0.19	0.99 $\pm$ 0.01	1.01 $\pm$ 0.06	1.62 $\pm$ 0.10
<b>200 <math>\mu\text{g/mL}</math> SPIONs</b>	1.83 $\pm$ 0.23	0.98 $\pm$ 0.03	0.98 $\pm$ 0.06	1.59 $\pm$ 0.09
<b>500 <math>\mu\text{g/mL}</math> SPIONs</b>	1.60 $\pm$ 0.21	0.97 $\pm$ 0.02	0.97 $\pm$ 0.10	1.64 $\pm$ 0.10

*The parameters are defined as strand diameter ( $D_r$ ), strand uniformity ( $U_r$ ), strand angle ( $\alpha_r$ ), and inter-strand area ( $A_r$ ) ratios, obtained using equations (5) to (8).*

**Table S2.** Average Young's moduli (N/m) of 3D bioprinted SPION-laden scaffolds obtained using microindentation tests (slope of the curve at 90-100% displacement). Raw modulus values of scaffolds with varying concentrations of SPIONs in the ink are listed ( $n = 5$  per study group).

	<b>0 <math>\mu\text{g/mL}</math> SPIONs</b>	<b>100 <math>\mu\text{g/mL}</math> SPIONs</b>	<b>200 <math>\mu\text{g/mL}</math> SPIONs</b>	<b>500 <math>\mu\text{g/mL}</math> SPIONs</b>
Sample 1	123.94	75.59	111.86	118.31
Sample 2	184.43	116.35	103.57	129.57
Sample 3	148.51	84.15	114.98	119.90
Sample 4	134.33	121.80	105.03	147.02
Sample 5	127.91	106.34	104.98	117.46
<b>Average modulus (N/m)</b>	<b>143.82</b>	<b>100.84</b>	<b>108.08</b>	<b>126.45</b>
<b>Std Dev</b>	<b>24.54</b>	<b>20.16</b>	<b>5.03</b>	<b>12.48</b>