Supporting information: Magnetic resonance imaging of alginate beads containing pancreatic islets and paramagnetic nanoparticles

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SUPPLEMENTARY METHODS

Characterization of Mesoporous Silica Nanoparticles

X-ray diffraction (XRD): The pore structure of MSNs was assessed by low-angle X-ray diffraction using a Siemens D5000 (reflection, θ-θ configuration, Cu K_α = 1.541 Å, 40 kV, 30 mA, 1-8 ° 2θ, step size: 0.02 2θ, 0.02 s $step^{-1}$).

Nitrogen physisorption: Porosimetric analyses were performed with a nitrogen physisorption analyser (ASAP 2010, Micrometics) at 77 K. Before the measurement, samples were outgassed under vacuum for at least 6 h at 200 °C. The specific area, the total pore volume and the mean pore sizes were calculated with Autosorb 1.55 software (Quantachrome Instrument). The specific area was calculated by using the BET (Brunauer–Emmett–Teller) equation with P/P0 between 0.05 and 0.2. The total pore volume and the average pore diameter were calculated using NLDFT methods respectively at P/P0 = 0.95 and with all data.

Thermogravimetric Analysis (TGA): The percentage of grafted DTPA was calculated based on the mass loss quantified with a thermogravimetric analyzer (Netzsch STA 449C, under airflow of 20 mL min-1, with a heating rate of 10 °C min-1, between 35 °C and 700 °C). As the degradation on DTPA occurs between 200 °C and 500 °C, the mass loss range used to quantify the percentage of grafted DTPA was selected between 180 °C and 530 °C.

List of quantitative RT-PCR primers

Table S1. List of primers used to test MIN6 cell gene expression.

Gene	Forward primer (5' to 3')	Reverse primer (5' to 3')	Amplicon size (bp)
Ins1	TCAGAGACCATCAGCAAGCA	GGGACCACAAAGATGCTGTT	134
Ins2	GGAGCGTGGCTTCTTCTACA	CAGTGCCAAGGTCTGAAGGT	115
Nkx6-1	ATCTTCTGGCCCGGAGTG	TCTCTCTGGTCCTGCCAAG	192
Glut2	CTGTGTCCAGCTTTGCAGTG	CCATCAAGAGGGCTCCAGTC	129
Pdx1	GACCTTTCCCGAATGGAACC	GTTCCGCTGTGTAAGCACC	135

SUPPLEMENTARY RESULTS

The complete interpretation of the graphs in Figure S1 was done in previous work.[1] The XRD pattern (Figure S1 a) confirmed the synthesis of MCM-48 type nanoparticles. The mass loss between 200 °C and 500 °C was 5 % which is the optimum quantity for DTPA grafting.[2] The physisorption information was reported in Table S1 before (Figure S1 c) and after (Figure S1 d) DTPA grafting on the MSNs. The low evolution of the specific surface, the pore volume and the pore diameter after grating confirmed that the porosimetric properties of the MSNs were preserved.

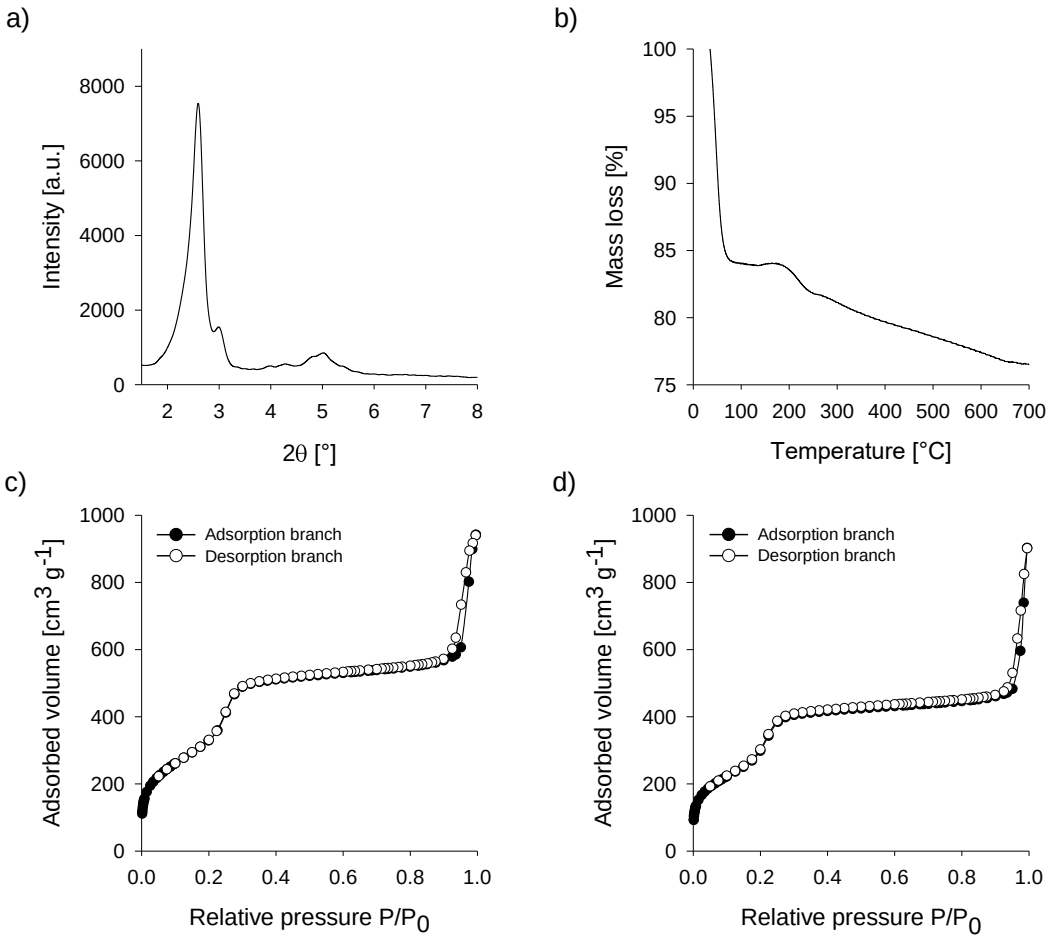

Figure S1. XRD pattern of pristine MSNs (a), TGA of the DTPA grafted MSN (b) and nitrogen physisorption of pristine MSNs (c) and DTPA grafted MSN (d).

Table S2. Characterization of MSN size and porosity

	Pristine MSNs	DTPA grafted MSNs
TEM diameter[a] (nm)	166	
Hydrodynamic diameter[b] (nm)	195	
Specific surface[c] ($m^2\ g^{-1}$)	1223.9	1106.8
Pore volume[c] ($cm^3\ g^{-1}$)	0.94	0.7
Pore diameter[c] (nm)	3.5	3.2

[a]Number weighed diameter measured by TEM.

[b]Number weighed hydrodynamic diameter measured by DLS.

[c]Data extracted from nitrogen physisorption.

Table S3. MRI signal intensity of cell-free alginate beads without nanoparticles compared to MRI signal intensity of nanopure water

Sample	Medium	Repetition time (TR) in T_1-w. MRI [ms]	Intensity (average of 3 samples)	Standard. deviation (+/-)	Relative error (std.dev./int.) [%]
Control beads	Complete medium	400	3386	16	0.48
Control beads	Complete medium	700	5567	68	1.22
Control beads	Complete medium	1000	7219	269	0.61
Control beads	HEPES buffer +10% medium	400	3428	104	3.04
Control beads	HEPES buffer +10% medium	700	5418	70	1.30
Control beads	HEPES buffer +10% medium	1000	7201	44	1.44
Nanopure Water	-	400	3110	66	2.13
Nanopure Water	-	700	5364	76	1.42
Nanopure Water	-	1000	6975	104	0.98

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