

Supplemental information

Title: Regulation of Macrophage Uptake Through the Bio-nano Interaction Using Surface Functionalized Mesoporous Silica Nanoparticles with Large Radial Pores

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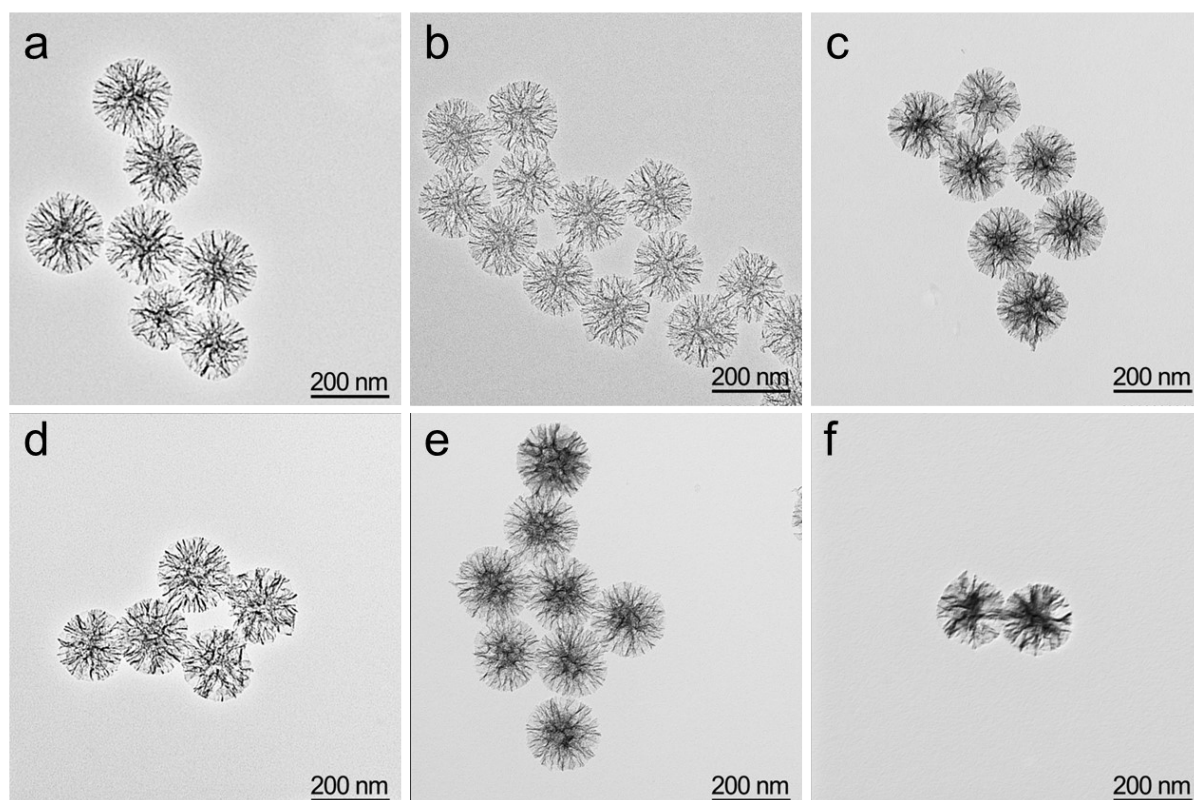


Fig. S1 TEM images of MSN-CC (a), MSN-CC-PO₄ (b), MSN-CC-NH₂ (c), MSN-CC-SH (d), MSN-CC-PEI (e) and MSN-CC-PEG_{2k} (f).

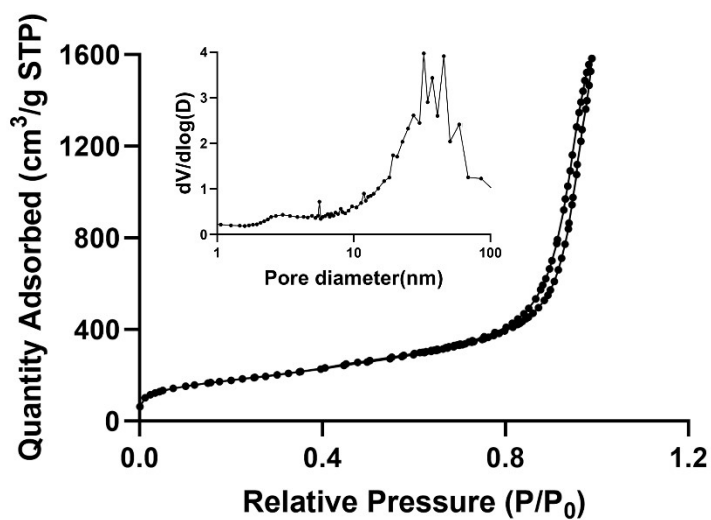


Fig.S2 N₂ sorption isotherm and pore size distribution curve for MSN-CC

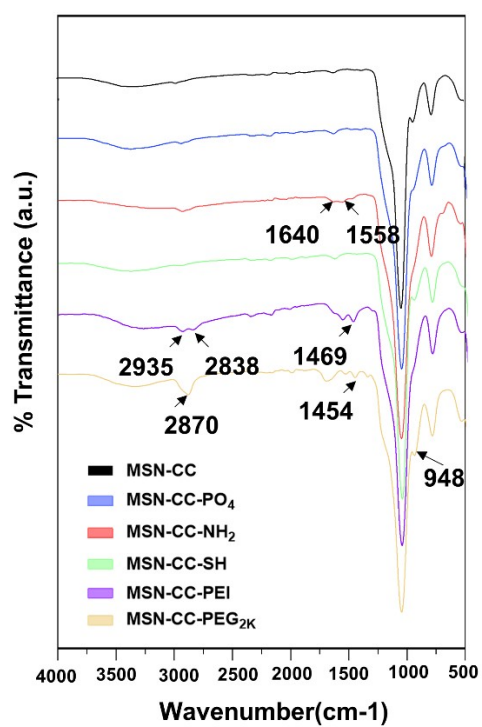


Fig. S3 Fourier transform infrared (FTIR) spectra of MSN-CC and surface-modified MSN-CC nanoparticles.

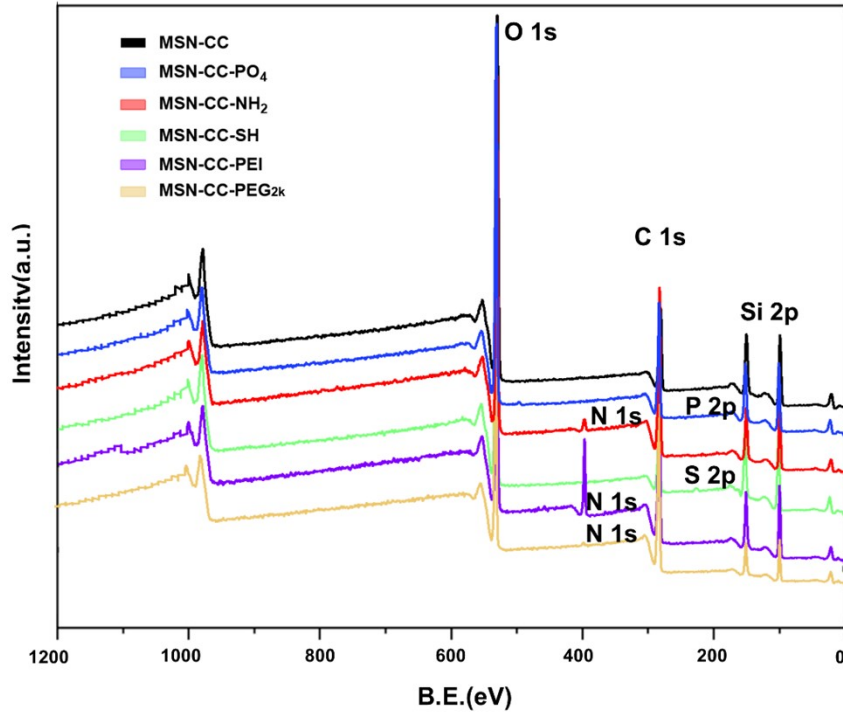


Fig. S4 XPS spectra of MSN-CC and surface-modified MSN-CC.

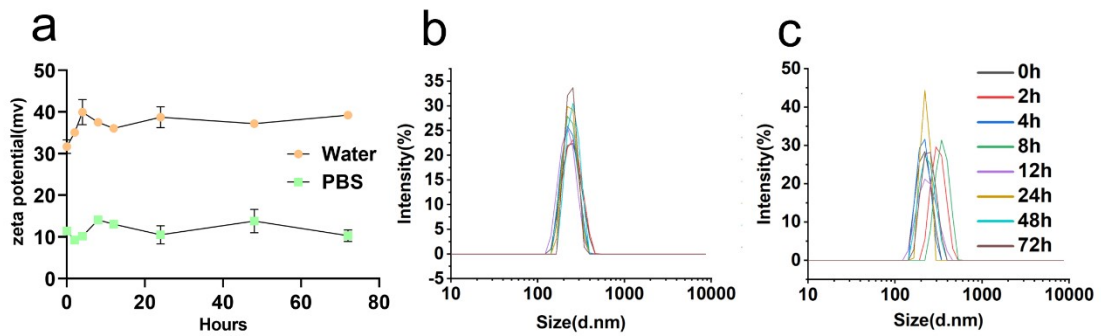


Fig. S5 Time-dependent zeta potential and hydrodynamic diameters of MSN-CC-PEI in both Milli-Q water and PBS (pH 7.4). (a) Zeta potential of MSN-CC-PEI in Milli-Q water and PBS. (b) Hydrodynamic diameters of MSN-CC-PEI in Milli-Q water at different time points. (c) Hydrodynamic diameters of MSN-CC-PEI in PBS (pH 7.4) at different time points.

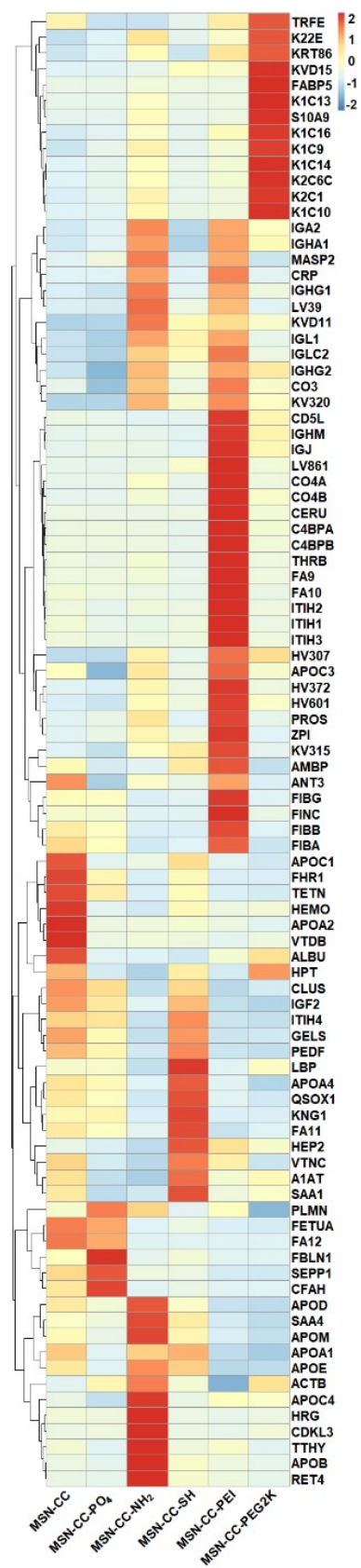


Fig. S6 Heat map of the top 5% protein in the protein corona around surface modified MSN-CC.

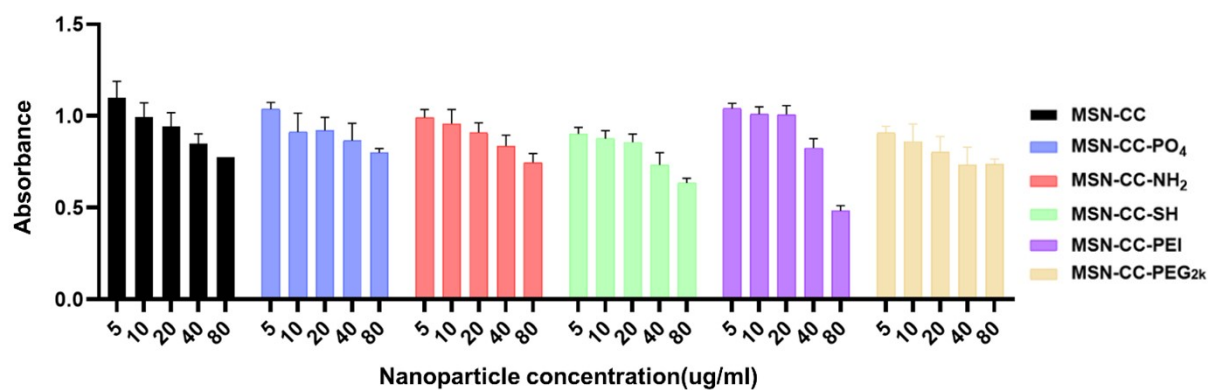


Fig. S7 Cell toxicity testing with MTT assays after Raw 264.7 being treated with surface-modified MSN-CC for 24 hours.

Table S1. Atomic percentage composition in the functionalized MSN-CC measured by XPS

Nanoparticles	Atomic concentration (%)					
	Si 2p	C 1s	O 1s	N 1s	P 2p	S 2p
MSN-CC	25.82	30.31	43.87	-	-	-
MSN-CC-PO ₄	21.86	38.59	39.55	-	-	-
MSN-CC-NH ₂	17.50	47.53	33.07	1.90	-	-
MSN-CC-SH	27.63	27.50	43.55	-	-	1.32
MSN-CC-PEI	15.19	48.49	28.25	8.08	-	-
MSN-CC-PEG _{2k}	11.23	57.00	31.44	0.34	-	-

Table S2. TGA analysis of MSN-CC and surface functionalized MSN-CC nanoparticles

Nanoparticles	Surface modification grafted onto MSN-CC (%)		
	Weight loss at 100 °C	Weight loss at 900 °C	

	(%)	(%)	
MSN-CC	4.9%	7.8%	
MSN-CC-PO ₄	4.7%	9.9%	2.1%
MSN-CC-NH ₂	4.4%	15%	7.2%
MSN-CC-SH	3.3%	9.2%	1.4%
MSN-CC-PEI	9.1%	43.8%	36.0 %
MSN-CC-PEG _{2k}	1.1%	37.8%	30.0%

Table S3. Summary of zeta potential and polydispersity index (PDI) of MSN-CC-PEI in both milli-Q water and PBS(PH=7.4).

Time points(h)	<i>Zeta potential (mv) in water</i>	<i>Zeta potential (mv) in PBS</i>	PDI in water	PDI in PBS	Hydrodynamic size(nm) in water	Hydrodynamic size(nm) in PBS
0	31.7±1.7	11.4±1.0	0.229±0.015	0.342±0.037	263±4.8	254.5±22.5
2	35.1±0.6	9.25±0.7	0.178±0.019	0.33±0.059	265.9±3.1	325±6.7
4	39.9±3.0	10.17±0.8	0.226±0.022	0.344±0.012	253.6±5.7	303.8±2.6
8	37.5±1.0	14.1±0.7	0.341±0.009	0.399±0.03	299.2±10.7	350.5±19.9
12	36.1±0.7	13.1±0.7	0.33±0.035	0.375±0.024	266.6±11.1	279.5±15.5
24	38.7±2.5	10.5±2.2	0.34±0.032	0.429±0.023	303.9±13.4	264.1±35
48	37.2±0.4	13.8±2.8	0.293±0.05	0.307±0.004	312.3±2.3	291.5±9.1
72	39.2±0.8	10.31±1.4	0.331±0.077	0.425±0.02	309.8±13.6	301.2±25.3