Nano-confinement driven enhanced magnetic relaxivity of SPIONs for targeted tumor bioimaging

Tuyen Duong Thanh Nguyen [ab], Arunkumar Pitchaimani [abc], Colin Ferrel [bc], Ravindra Thakkar [bc], and Santosh Aryal [ab]*

[a] *Department of Chemistry, Kansas State University, Manhattan, KS 66506, USA.*

[b] *Nanotechnology Innovation Center of Kansas State (NICKS), Kansas State University, Manhattan, KS 66506, USA.*

[c] *Department of Anatomy and Physiology, Kansas State University, Manhattan, KS 66506, USA.*

*Corresponding author: saryal@ksu.edu
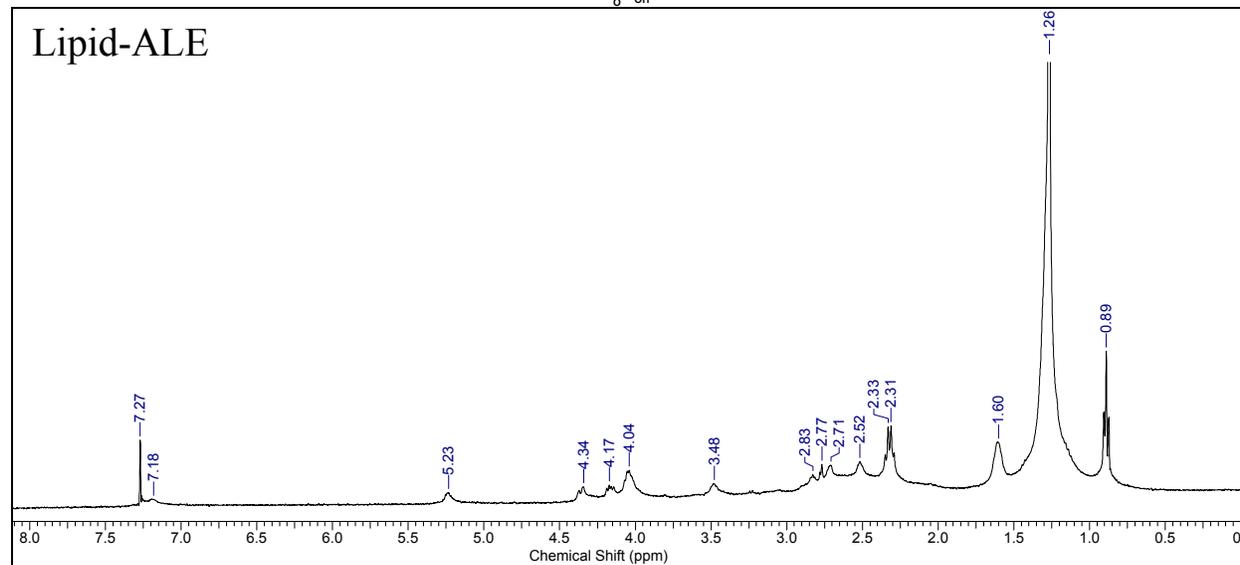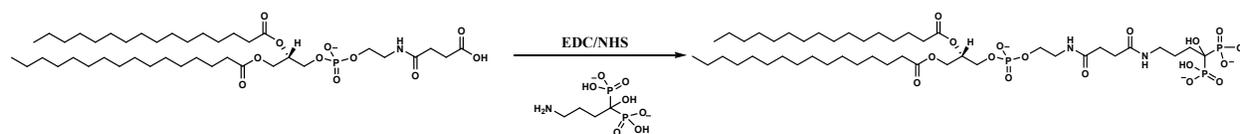
Supporting information

Figure S1. Synthesis scheme of ALE conjugate lipid reaction along with ^{1}HNMR of ALE-Lipid
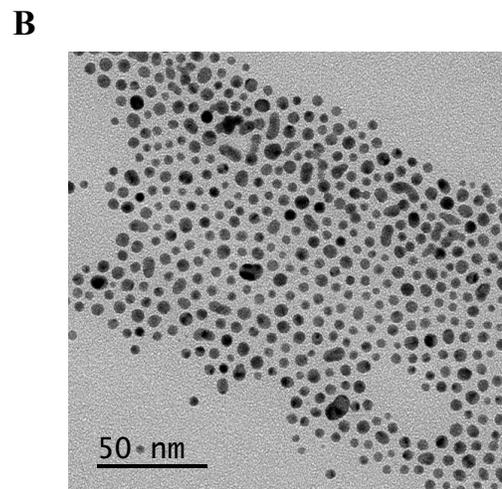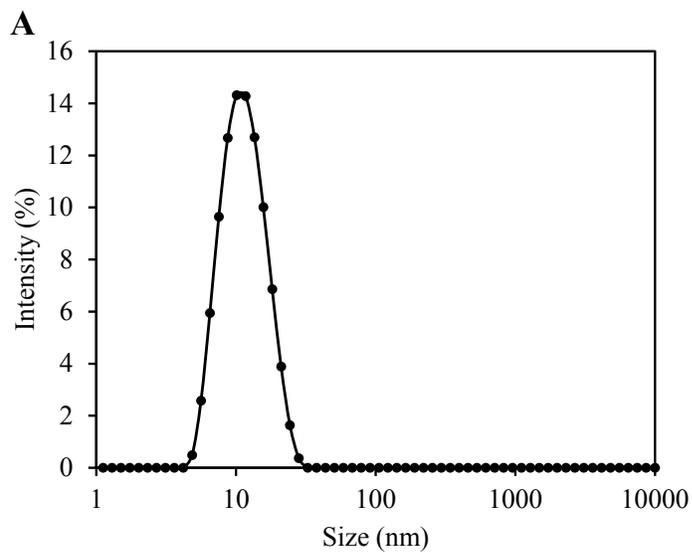
A

B

50 nm

Figure S2. Physicochemical properties of superparamagnetic iron oxide nanoparticles (SPIONs). (A) Dynamic light scattering showing size distribution of SPIONs. (B) Transmission electron micrograph showing morphology of SPIONs.

Table S1. Physicochemical properties of HNCs with different SPIONs input (n=6) and SPIONs loaded control PEGylated NPs

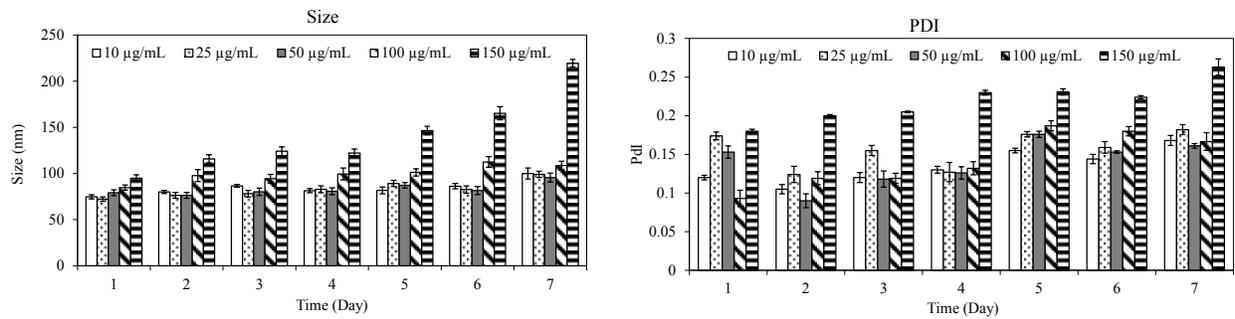| Amount of SPIONs input (μg/mL)	10	25	50	100	150	SPION loaded PEGylated NPs
Hydrodynamic size (nm)	80.5 ± 6.1	82.8 ± 5.2	79.9 ± 4.5	82.5 ± 8	83.4 ± 3.2	86.8 ± 3.8
PDI	0.214 ± 0.122	0.266 ± 0.166	0.270 ± 0.071	0.214 ± 0.034	0.282 ± 0.101	0.146 ± 6
PDI width (nm)	33.7 ± 7.1	32.71 ± 4.3	40.5 ± 5	37.4 ± 2.3	39.5 ± 5.9	33.2 ± 6
Zeta potential (mV)	-35.3 ± 0.68	-36.4 ± 1.01	-34.6 ± 0.52	-33.4 ± 0.95	-34.9 ± 1.2	-49.9 ± 5.7

Figure S3. Stability of different formulation of HNC in ionic condition (PBS)
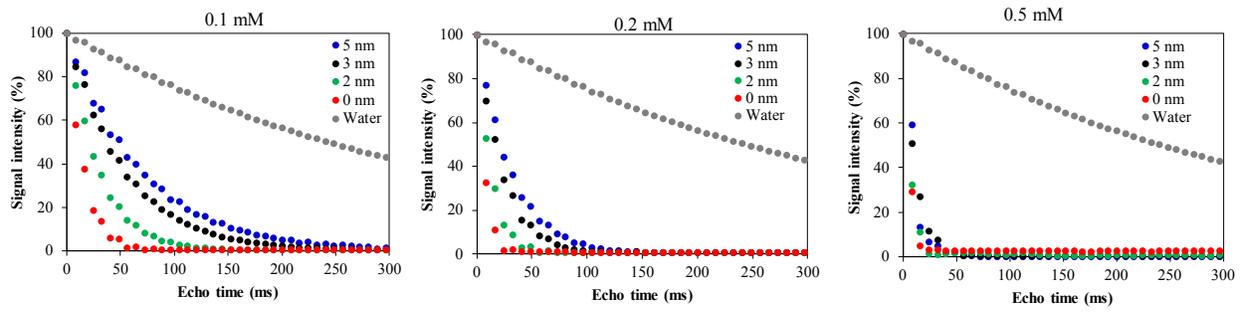
Figure S4. MR decay curve of 4 different kinds of SPIOs nanocluster at 0.1, 2, and 0.5 mM measured at TR=1500 ms. Water was used as control
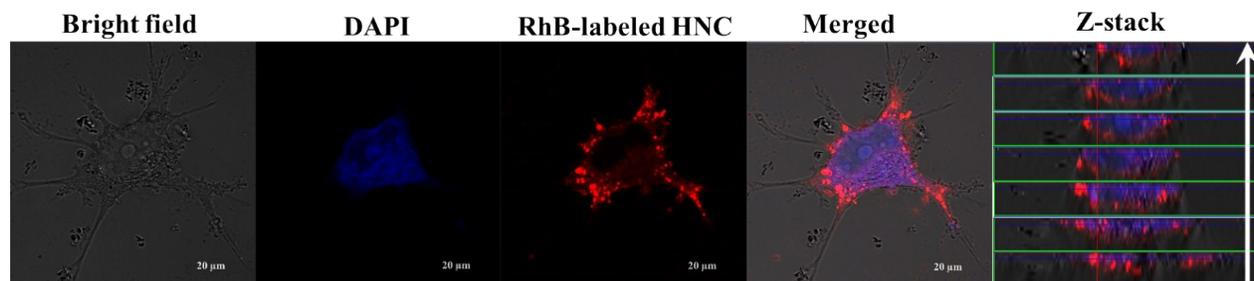
Figure S5. Confocal images of K7M2 cells incubated with RhB labeled HNC for 3h, at 37ºC. The cell nuclei were stained by DAPI (blue).
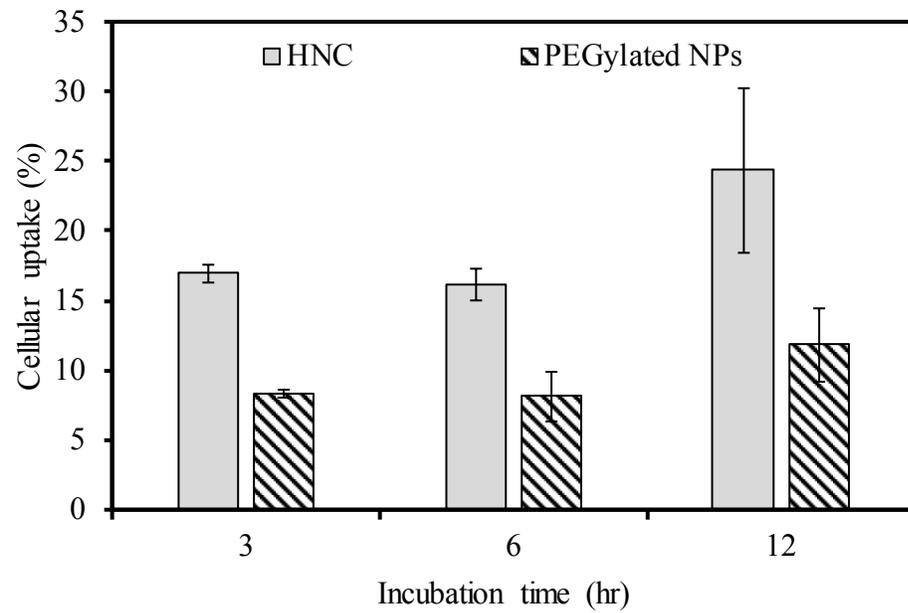
Figure S6. Cellular uptake of HNC quantified by ICP-MS. PEGylated NPs were used as control

Figure S7. (A) Ex-vivo MR images of tumor bearing mouse at different z-plane after IV injection of SPIONs loaded PEGylated NPs (control NPs). (B) Histogram of signal intensity distribution obtained from ImageJ indicating that HNC produces darker contrast than SPIONs loaded PEGylated NPs.