

Supporting Information

Table S1. Sequence-specific MRI parameters for measurement of $\text{Fe}_3\text{O}_4\&\text{SiO}_2$ and $\text{Fe}_3\text{O}_4\&\text{SiO}_2$ -PEG nanoparticles.

	T_1 map	T_2 map	T_2^* map
Sequence	RARE-VTR sequence	MSME sequence with 15 echo images	MGE sequence with 16 echo images
TR/TE (ms/ms)	{100, 300, 700, 1,200, 2,000, 3,000, 4500}/6	2600/{7, 14, 21, ..., 105}	TR/ α = 1800/35°, TE= {5, 10, 15, ..., 80}
Echo spacing (ms)	6	7	5
RARE factor	2	-	-
Navg	1	2	3
BW (kHz)	50	40	40
Scan time	4 min, 20 s	3 min, 54 s	3 min, 3 s

Table S2. Sequence-specific MRI parameters for scans of mouse brains.

	T_2 image	T_2^* image
Sequence	TurboRARE sequence (spin echo)	MGE sequence (gradient echo)
TR/TE (ms/ms)	2600/26	TR/TE/ α = 1200/20/35°
Echo spacing (ms)	13	-
RARE factor	4	-
Navg	16	16
BW (kHz)	40	40
Pulse bandwidth (kHz)	2	4
Total scan time	15 min, 56 s	16 min, 38 s

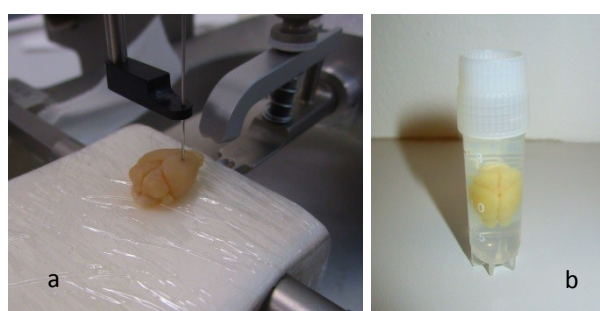


Figure S1. Sample preparation for MRI of $\text{Fe}_3\text{O}_4\&\text{SiO}_2$ and $\text{Fe}_3\text{O}_4\&\text{SiO}_2$ -PEG nanoparticles. (a) Stereotaxic injection of particles in mouse brain and (b) *ex vivo* mouse brain with injected particles in a freezer tube.