Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Polypropylene Sulphide Coating on Magnetic NPs as a Novel Platform for Excellent Biocompatible, Stimuli Responsive Smart Magnetic Nanocarrier for Cancer Therapeutics

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Tables

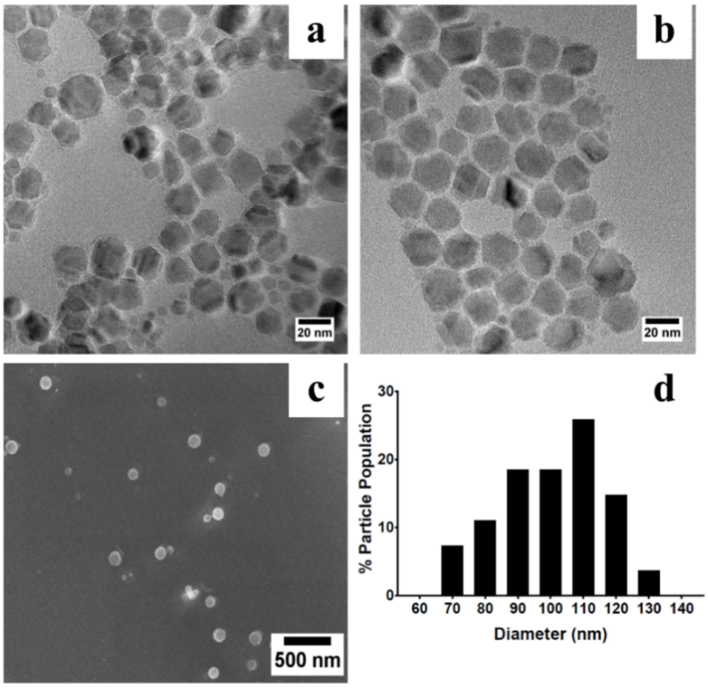
S. No	Nanoparticles	Size (nm)	PDI	Zeta potential
1	PPS NPs	89± 9	0.243 ±0.015	-10 ± 3
2	PPS-MnFe NPs	90 ± 13	0.190 ± 0.007	-12 ± 2
3	PPS-DOX NPs	87± 5	0.193± 0.003	-8 ± 4
4	PPS- MnFe-DOX NPs	114± 10	0.155±0.010	-9 ± 4

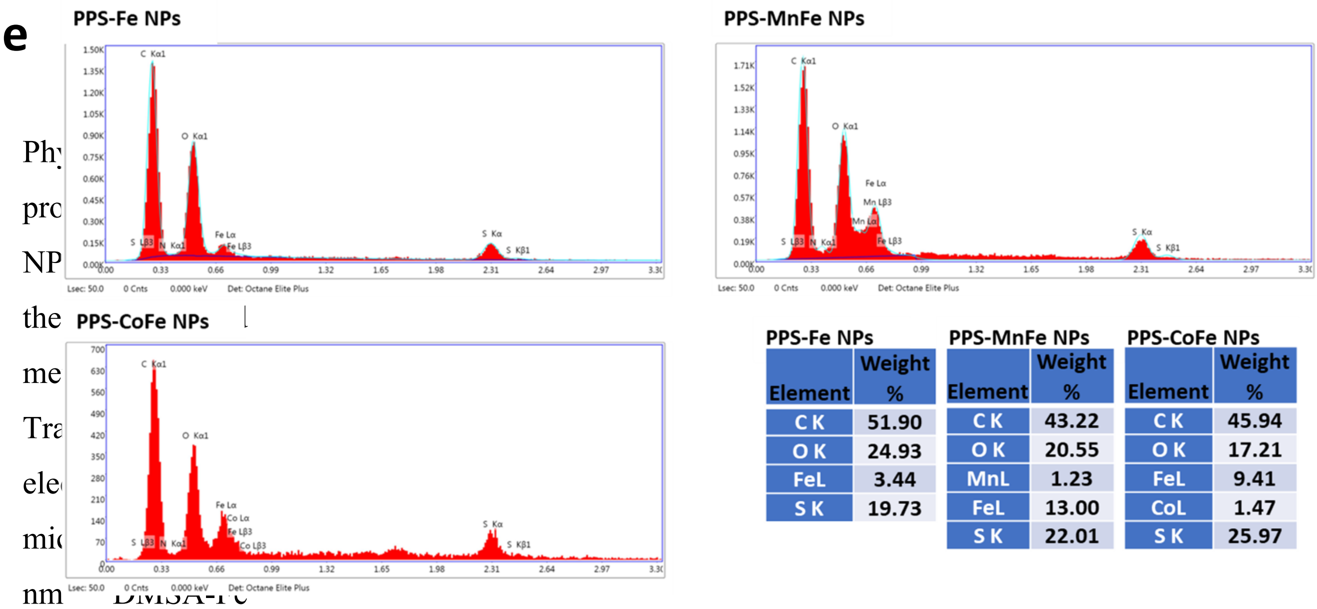
Table .1 Different NPs size (diameter in nm) with corresponding PDI and zeta potential

Types of NPs	SAR (W/g)	ILP (nHm^2/kg)
DMSA- Fe	115	1.16
DMSA- MnFe	214.5	2.16
DMSA- CoFe	109	1.10
PPS- Fe	136	1.37
PPS- MnFe	245	2.5
PPS- CoFe	78.5	0.79

Table 2. SAR and ILP value of DMSA-MNPs and PPS-MNPs under AMF treatment of 993 kHz frequency.

Figures





PPS-Fe NPs

Element	Weight %
C K	51.90
O K	24.93
FeL	3.44
S K	19.73

PPS-MnFe NPs

Element	Weight %
C K	43.22
O K	20.55
MnL	1.23
FeL	13.00
S K	22.01

PPS-CoFe NPs

Element	Weight %
C K	45.94
O K	17.21
FeL	9.41
CoL	1.47
S K	25.97

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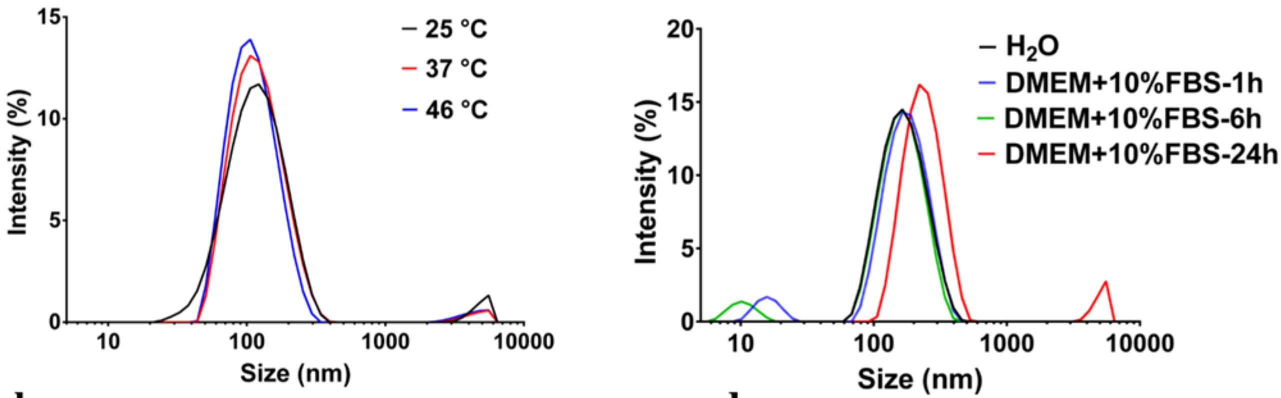
NPs. (b) Transmission electron microgram of 16 nm DMSA-CoFe NPs. (c) Scanning

electron microscopy (SEM) images of PPS MNPs. (d) Particles size distribution of the PPS- MNPs NPs obtained from the SEM images. (e) Energy Dispersive Spectroscopy (EDS) elemental analysis of the different PPS-MNPs i.e. PPS-Fe, PPS-MnFe PPS-CoFe.

a **c**



b

Temperature (°C)	Size (nm)	PDI
25	114±3	0.247667±0.008
37	108.2667±4	0.172333±0.003
46	105.3±2	0.163333±0.002

d

Media	Z-Ave d (nm)	PDI
H_20	110.2 ±2	0.154±0.005
DMEM+10%FBS-1hr	129±7	0.322±0.009
DMEM+10%FBS-6h	124.1±9	0.308±0.0027
DMEM+10%FBS-24h	226.7±20	0.356±0.040

Fi g. SI 2. Stability of the magnetic NPs (PPS-MnFe NPs) (a) Graph and (b) Table shows stability of the NPs in the different temperature (25, 37, 46 °C) for hyperthermia application. (c) Graph and (d) Table shows the serum stability study of the magnetic NPs in different time points 1, 6 and 24 h and in water at 37 °C.

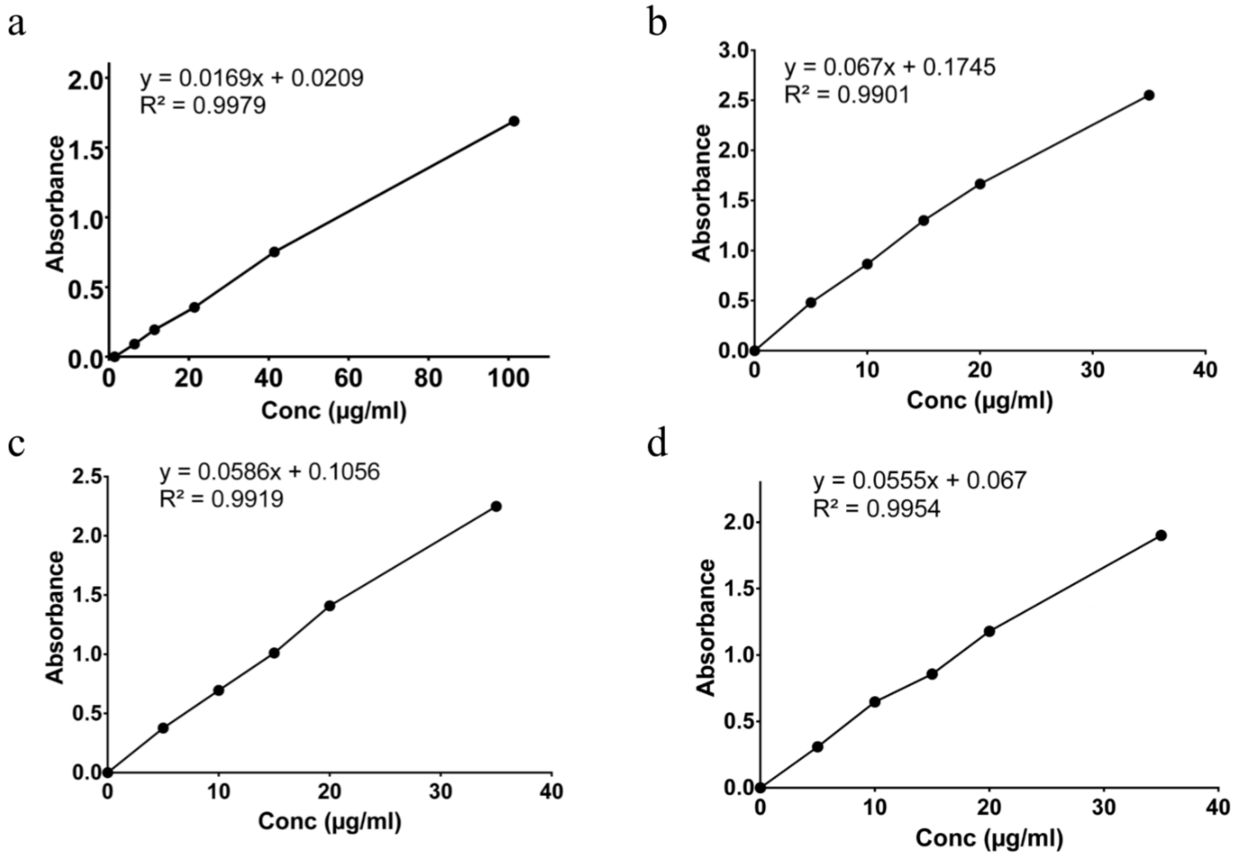


Fig. SI 3. Quantification calibration curves for doxorubicin and magnetic NPs (a) Calibration curve for doxorubicin in DMSO solvent at absorbance 480 nm. Calibration curves for quantification of (b) Fe, (c) MnFe, and (c) CoFe NPs using colorimetric analysis at absorbance 480 nm.

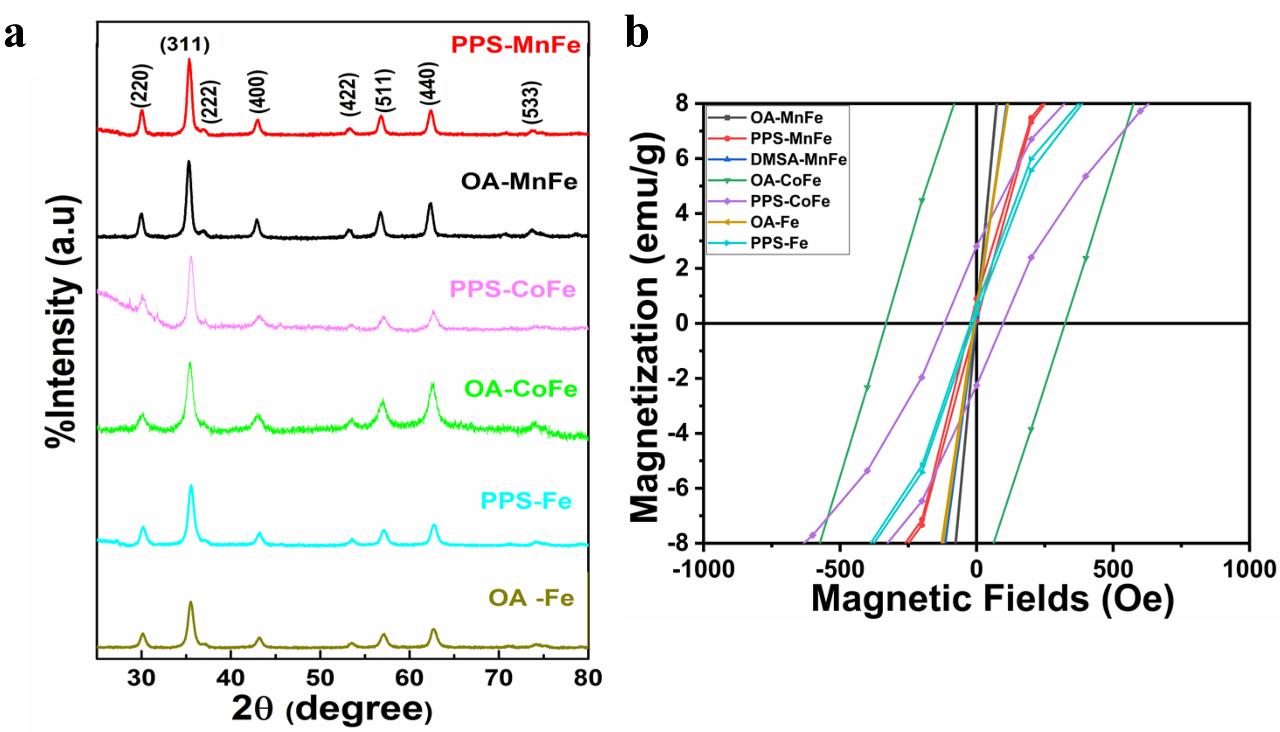
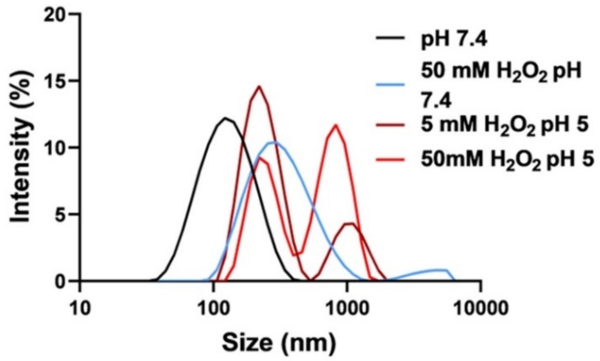


Fig. SI 4. (a) X-ray diffraction patterns of OA-MNPs and PPS-MNPs. These graphs indicate the crystalline structure of OA-MNPs and PPS-MNPs (b) Magnified graph of the M- H loop at a low magnetic field (□1000 to 100), where coercive field (Hc) of CoFe NPs (PPS coated and Plain) is higher than the other NPs, which proves that Fe and MnFe NPs have better superparamagnetic behaviour compare to CoFe NPs.



Condition	Size (nm)	PDI
pH 7.4	80±10	0.196±0.015
50mM H_2O_2 pH 7.4	230±31	0.39±0.037
5mM H_2O_2 pH 5	250±60	0.50±0.19
50mM H_2O_2 pH 5	750	1.00±0.02

Fig. SI 5. Gaussian distributions of the hydrodynamic diameter of PPS-MnFe-CUR shows the effect of different conditions i.e low pH and high ROS or dual stimuli i.e combination of ROS and pH to stimulate the cancer cells microenvironment. In this graph PPS-MNP shows the drastic increase in size to 700 nm with PDI> 0.8 under dual stimuli condition compared to physiological condition where size is 150 nm.

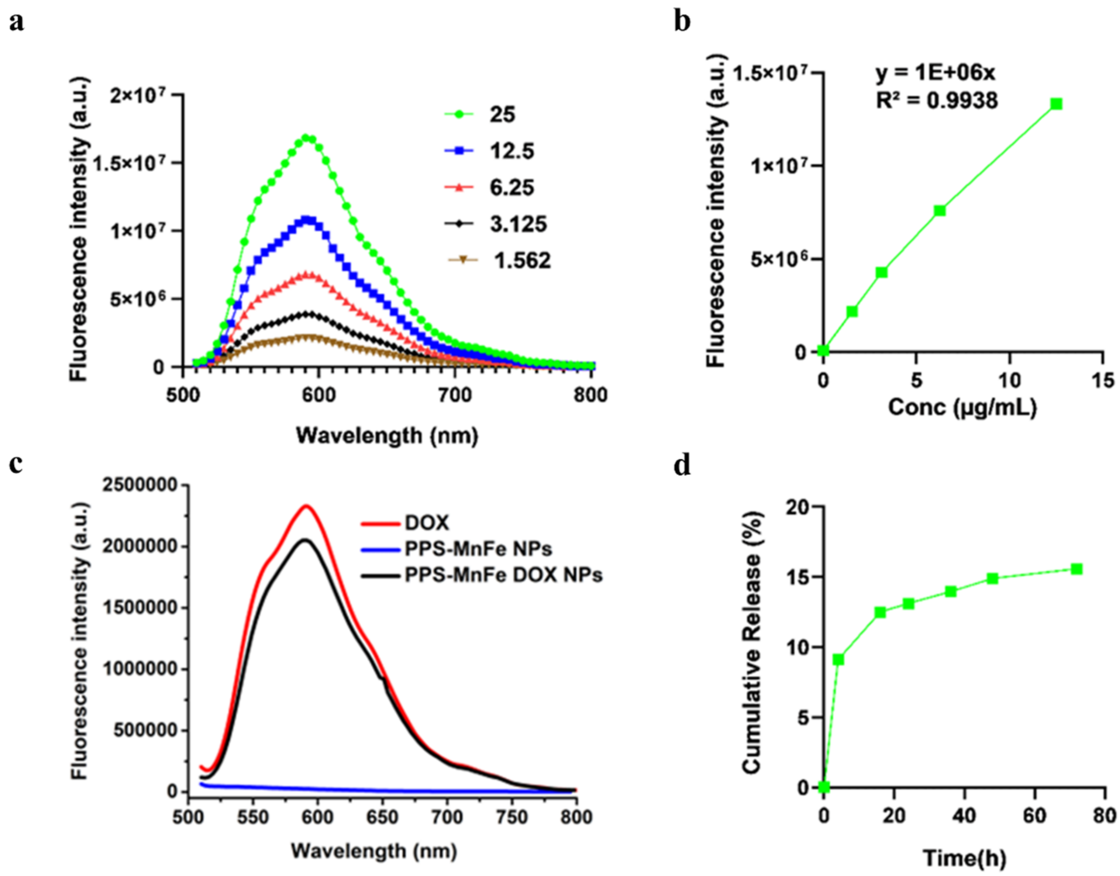


Fig. SI 6. Loading and release profile of the DOX from PPS-MnFe-DOX NPs (a) fluorescence spectra of DOX at various concentrations. (b) calibration curve of DOX. (c) fluorescence spectra of dox-loaded MNPs (PPS-MnFe DOX NPs) compared with free DOX and Plain PPS-MnFe NPs. (d) release profile of DOX from PPS-MnFe DOX NPs up to 72 hours under physiological conditions.

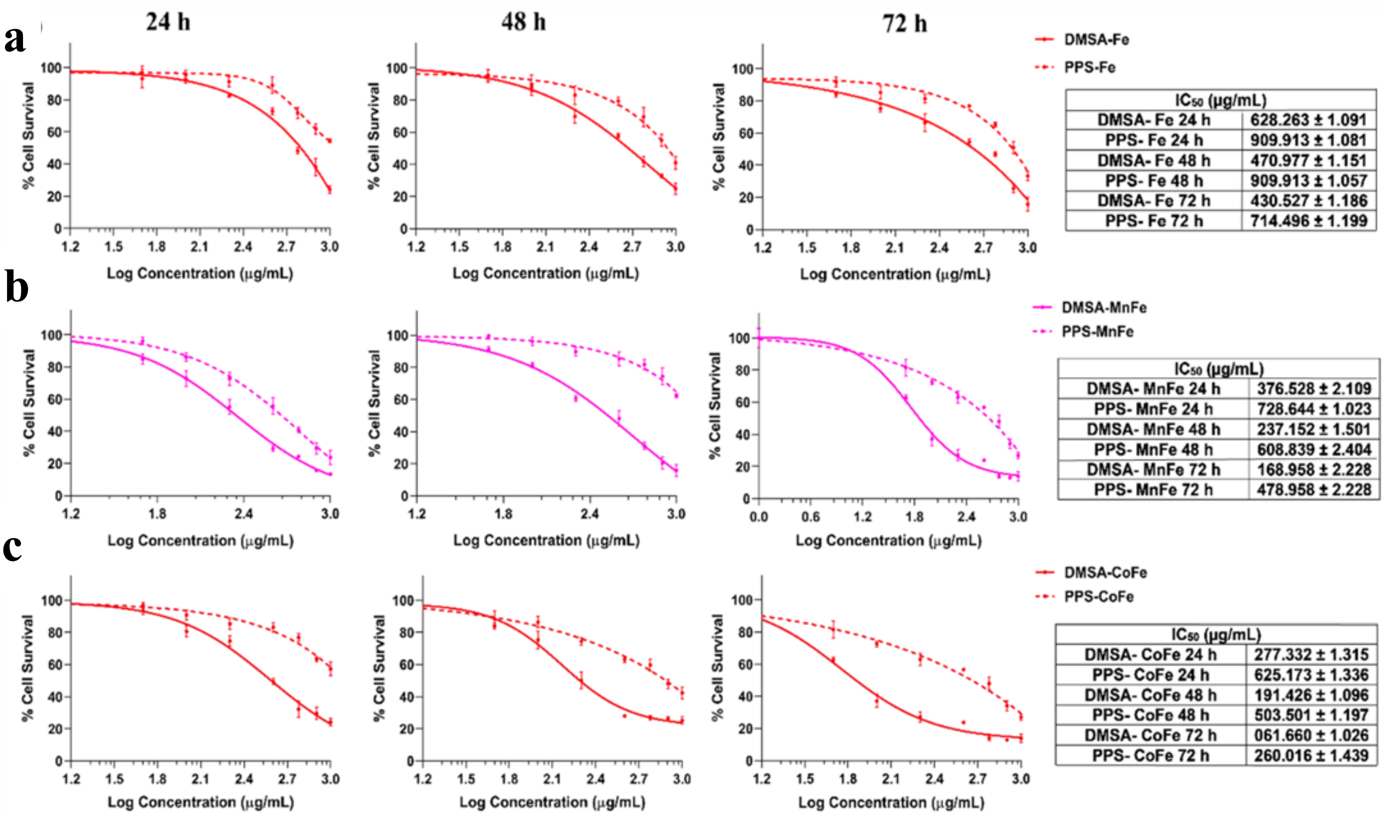
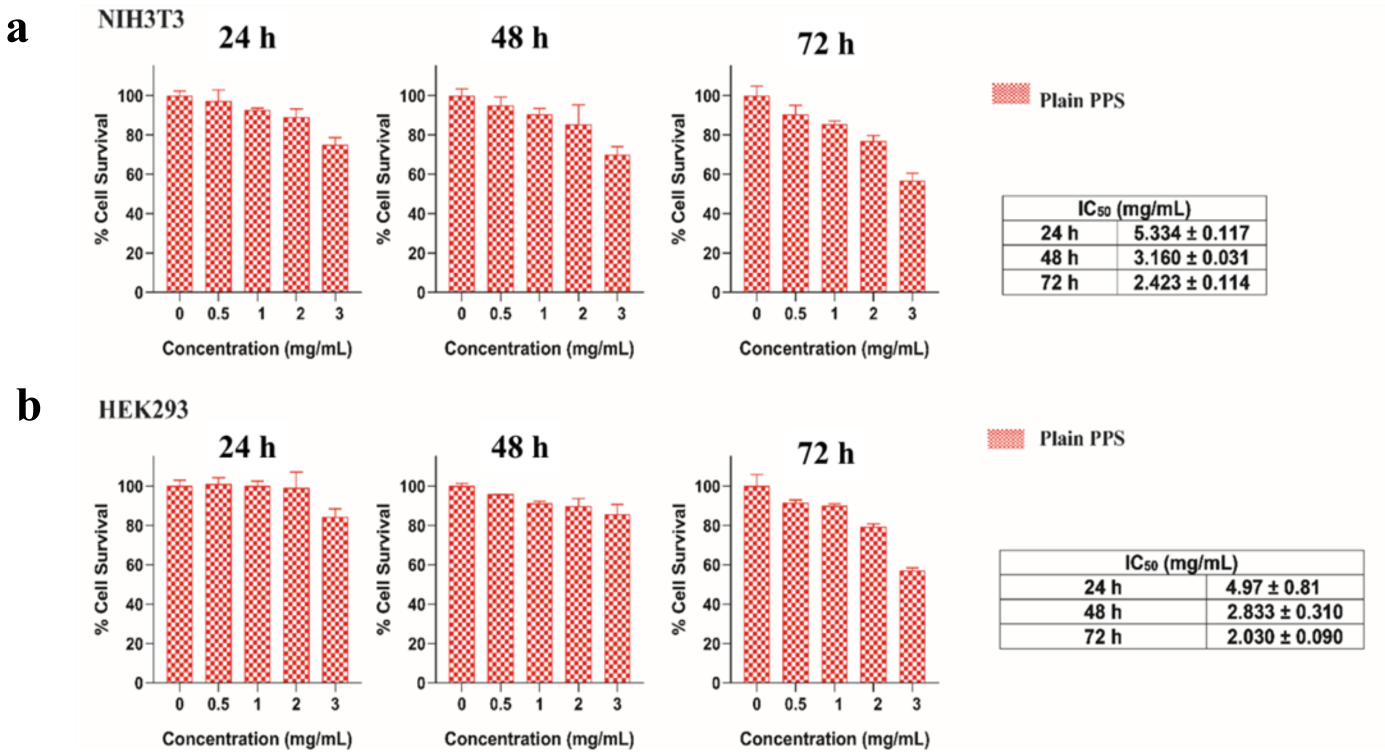


Fig. SI 7. (a) Cell viability assessment by MTS assay of HEK293 cells with DMSA-Fe NPs (solid line) and PPS-Fe NPs (dashed line) with variable concentrations (0-1000 µg/mL) for 24, 48 and 72 h incubation along with the IC_{50} values. (b) Cell viability assessment by MTS assay of HEK293cells with DMSA-MnFe NPs (solid line) and PPS-MnFe NPs (dashed line) with variable concentrations (0-1000 µg/mL) for 24, 48 and 72 h incubation along with the IC_{50} values. (c) Cell viability assessment by MTS assay of HEK293 cells with DMSA-CoFe NPs (solid line) and PPS-CoFe NPs (dashed line) with variable concentrations (0-1000 µg/mL) for 24, 48 and 72 h incubation along with the IC_{50} values.



IC50 (mg/mL)	
24 h	5.334 ± 0.117
48 h	3.160 ± 0.031
72 h	2.423 ± 0.114

IC50 (mg/mL)	
24 h	4.97 ± 0.81
48 h	2.833 ± 0.310
72 h	2.030 ± 0.090

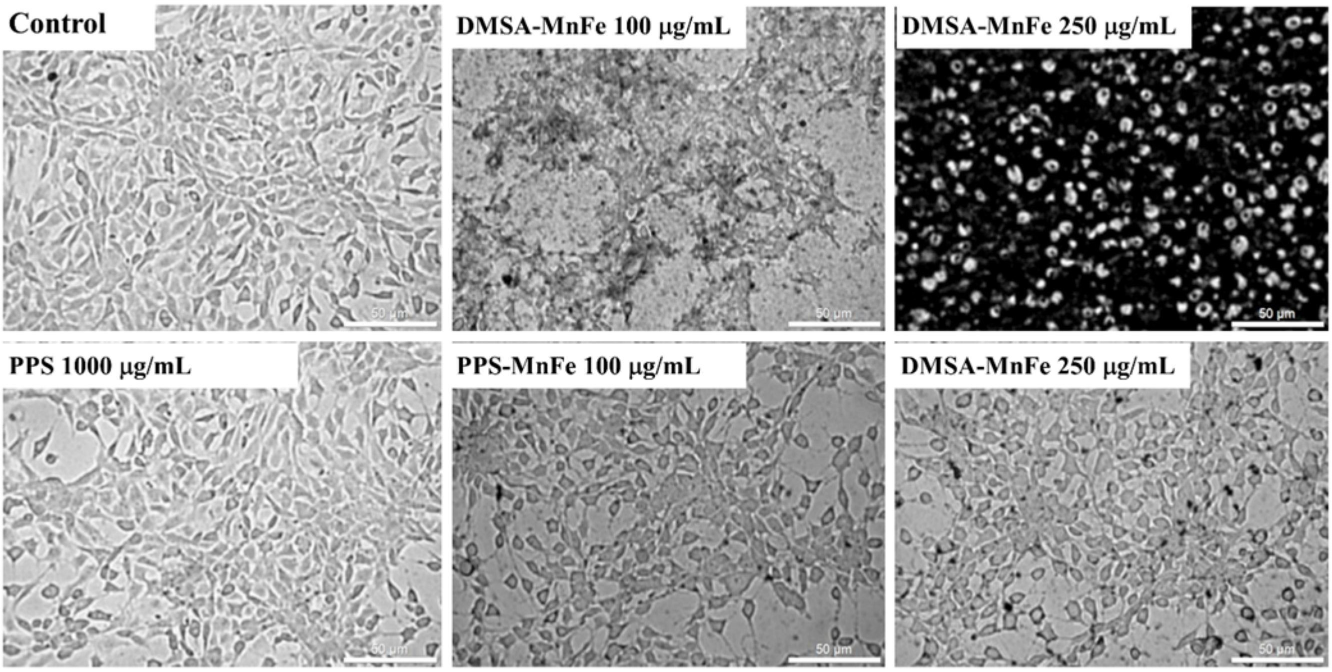


Fig. SI 9. Brightfield images of NIH3T3 cells treated with blank PPS NPs (1000 μg/mL), DMSA and PPS coated MnFe NPs at 100 μg/mL and 250 μg/mL concentrations for 72 h. *Scale bar: 50 μm*

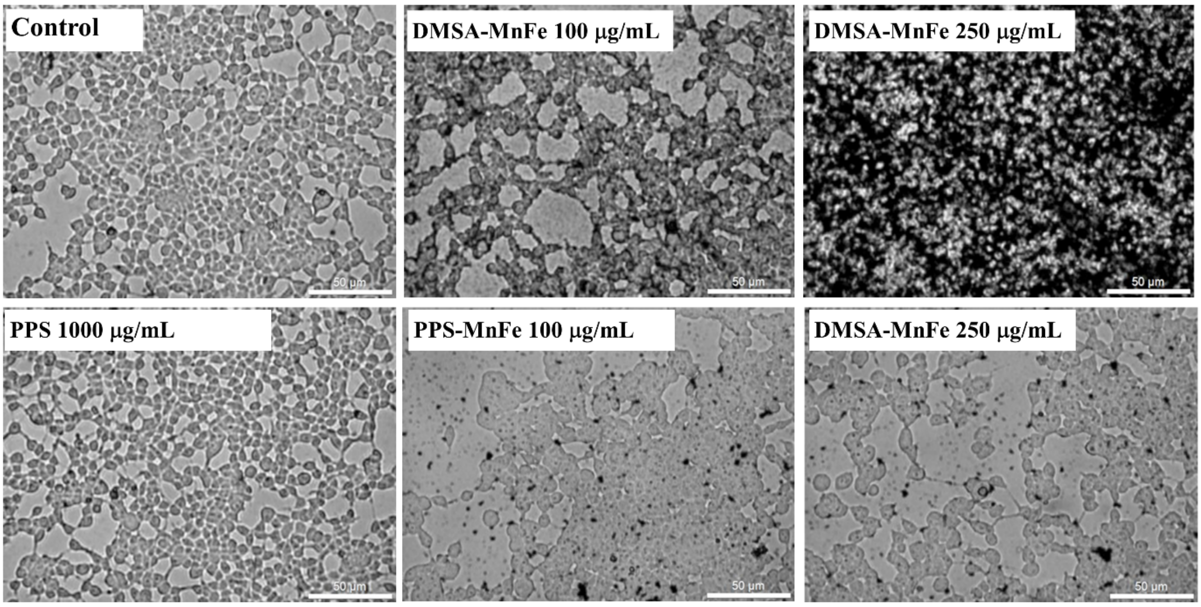


Fig. SI 10. Brightfield images of HEK293 cells treated with blank PPS NPs (1000 μg/mL), DMSA and PPS coated MnFe NPs at 100 μg/mL and 250 μg/mL concentrations for 72 h. *Scale bar: 50 μm*

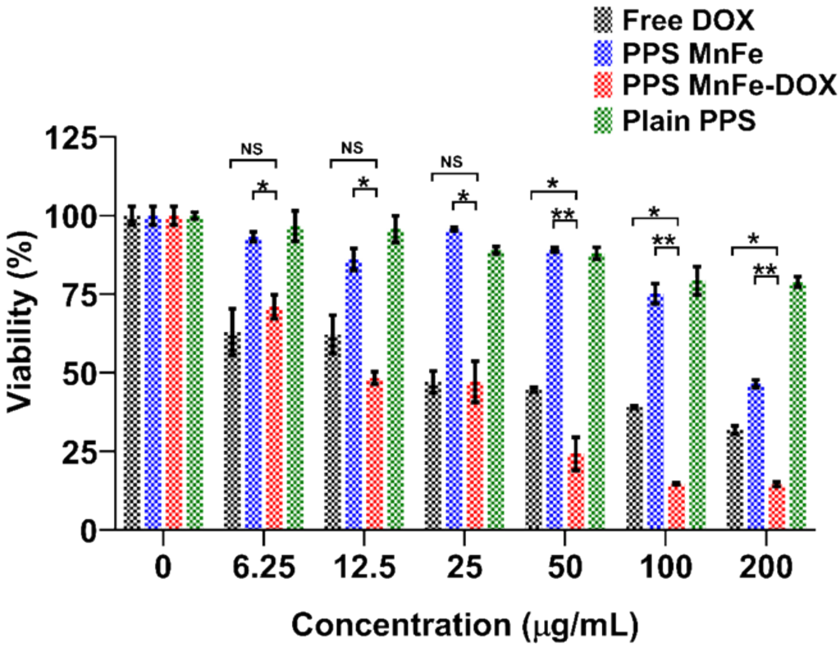


Fig. SI 11. Assessment of cellular toxicity of free DOX, PPS MnFe, PPS MnFe-DOX and blank PPS NPs on MCF-7 cells after 48 h of treatment by MTS assay