Electronic Supplementary Information

Monodisperse mesoporous cobalt ferrite nanoparticles: Synthesis and application in targeted delivery of antitumor drugs

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Figure S1

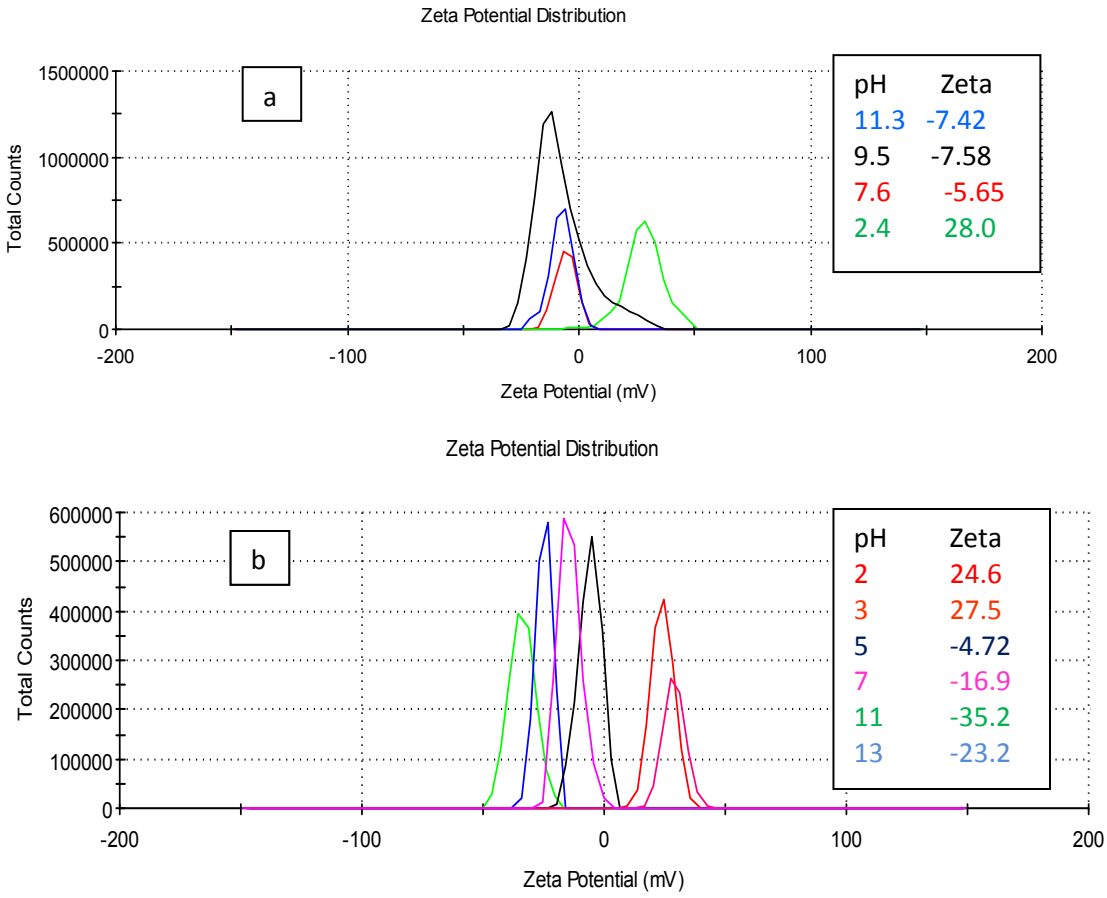

Figure S1 Change in zeta potential with respect to pH (a) as synthesized $CoFe_2O_4$ nanoparticles (b) after treated with succinic anhydride.

Figure S2

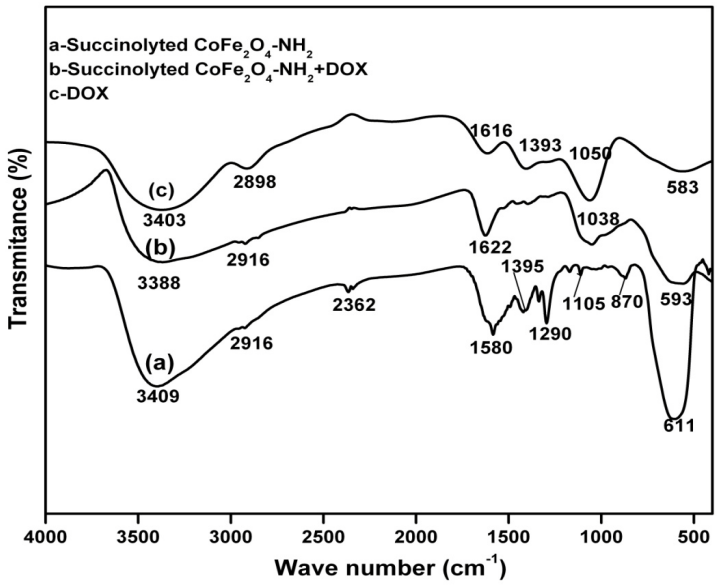

Figure S2 FTIR spectra demonstrating conjugation of doxorubicin on –COOH functionalized nanoparticles

Figure S3

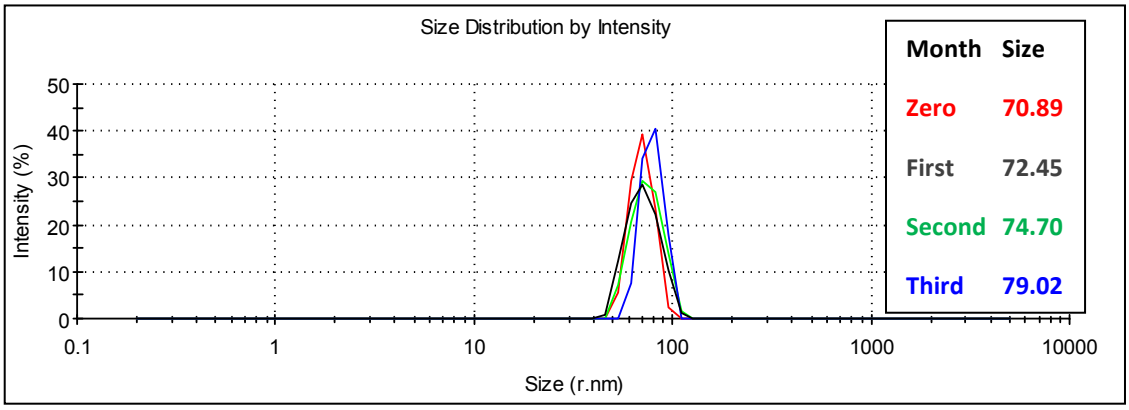

Figure S3 Change in HD size of DOX loaded particles with time

Figure S4

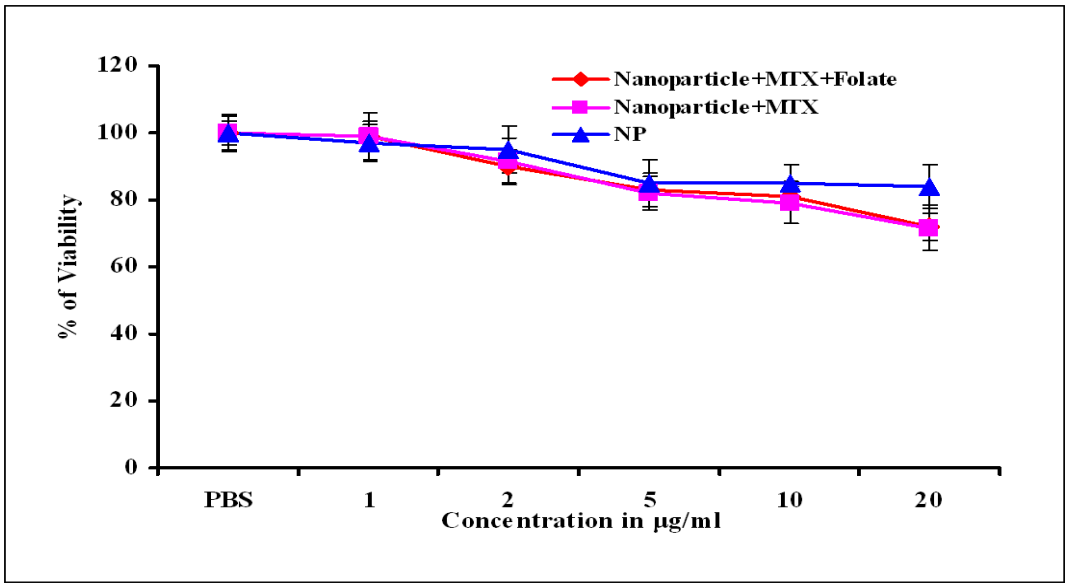

Figure S4 Cytotoxicity assay of nanoparticles on NIH/3T3 cells. Cells were treated with different concentrations of nanoparticles for 72 h and cell viability was measured by MTT assay.

Figure S5

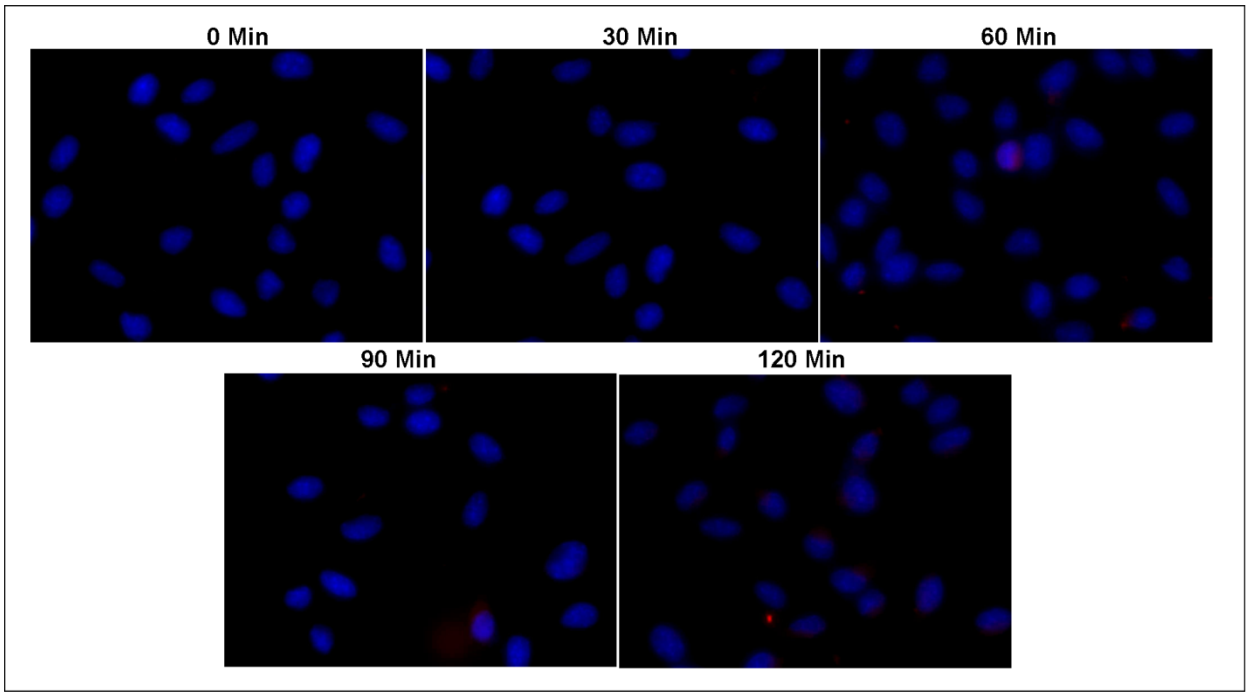

Figure S5 Uptake study of nanoparticle in NIH/3T$_3$ cells using florescence microscopy. Cells were incubated with $CoFe_2O_4$-FA-RITC-MTX nanoparticles for different time intervals and observed under florescence microscope (200X).

Calculation of drug loading capacity

The drug loading capacity was calculated as per the following method. First, NH_2 /-COOH functionalized particles were conjugated with MTX/DOX as described in the experimental section and then separated from the aqueous suspension medium using magnetic separator (Invitrogen). The obtained drug-loaded $CoFe_2O_4$ nanoparticles were incubated at 60 °C in vacuum overnight and were weighted. Drug concentration in supernatant was analyzed by the ultraviolet absorption (λ_{MTX} = 270 nm, λ_{DOX} = 255 nm), with reference to a calibration curve on a UV-Vis-NIR spectrophotometer. The measurements were performed in triplicate. Drug-loading content and encapsulation efficiency were obtained by eqs 1 and 2, respectively [1,2].

Doxorubicin

$$\text{Drug-loading content (\%)} = \frac{\text{Weight of the drug in nanoparticles}}{\text{weight of the nanoparticles}} \times 100 \quad \text{.....(1)}$$

$$= \frac{0.00944}{0.0697} \times 100$$

$$= 13.54\ \%$$

$$\text{Encapsulation efficiency (\%)} = \frac{\text{Weight of the drug in nanoparticles}}{\text{Weight of the feeding drug}} \times 100 \text{.....} \quad \textbf{(2)}$$

$$= \frac{0.00944}{0.0118} \times 100 = 80\%$$

Methotrexate

Drug-loading content (%) = 13.8 %

Encapsulation efficiency= 80%

Table 1

Approximate estimation of functional groups/molecules on the surfaces of synthesized nanoparticles, ND (not determined)

Nanoparticles	-NH_2	FA	RITC	MTX	-COOH	DOX
$CoFe_2O_4$	490	----	----	----	-----	-----
$CoFe_2O_4$-FA	352.8	120	----	----	ND	ND
$CoFe_2O_4$-FA-RITC	321.9	120	46	ND	ND	ND
$CoFe_2O_4$-FA-RITC-MTX	40.8	120	46	280	ND	ND
$CoFe_2O_4$-FA-COOH	34	120	46	----	325	-----
$CoFe_2O_4$ -FA-DOX	34	112	46	----	25	298

Reference

1. Wang Wei, Zou M, and Chen K, Novel Fe_3O_4@YPO_4 :Re (Re = Tb, Eu) multifunctional magnetic–fluorescent hybrid spheres for biomedical applications, *Chem. Comm*. 2010; 46: 5100-5102.
2. Li S, Ma Y, Yue X, Cao Z and Dai Z, One-pot construction of doxorubicin conjugated magnetic silica nanoparticles, *New Journal of Chemistry*, 2009; 33: 2414-2418.