

Electronic Supplementary Information

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

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Figure S1

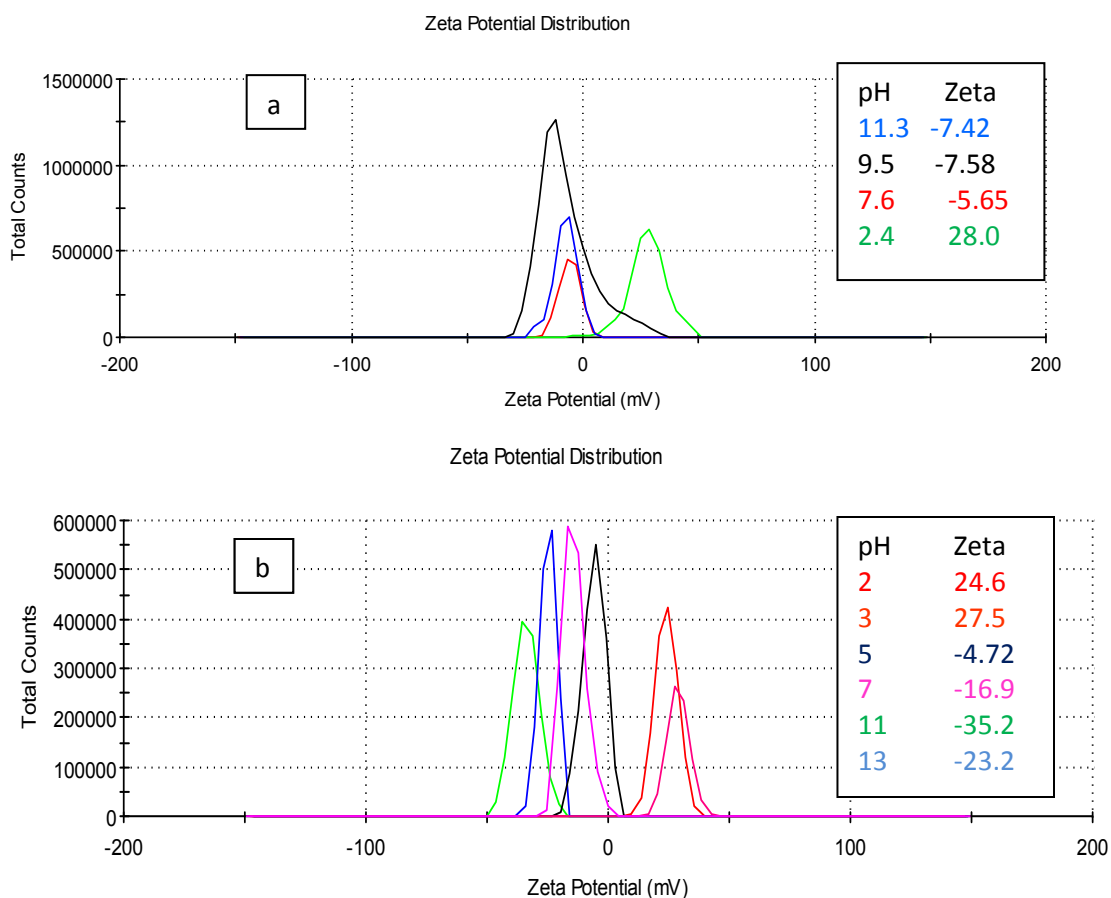


Figure S1 Change in zeta potential with respect to pH (a) as synthesized CoFe_2O_4 nanoparticles (b) after treated with succinic anhydride.

Figure S2

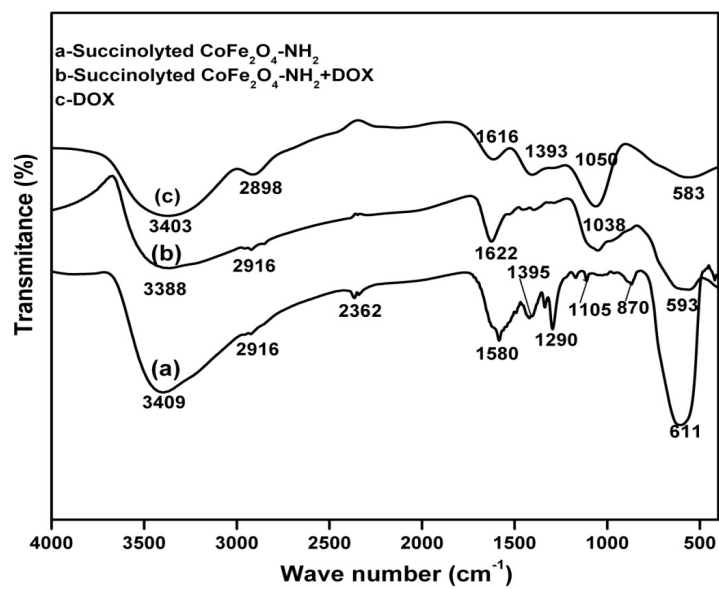


Figure S2 FTIR spectra demonstrating conjugation of doxorubicin on -COOH functionalized nanoparticles

Figure S3

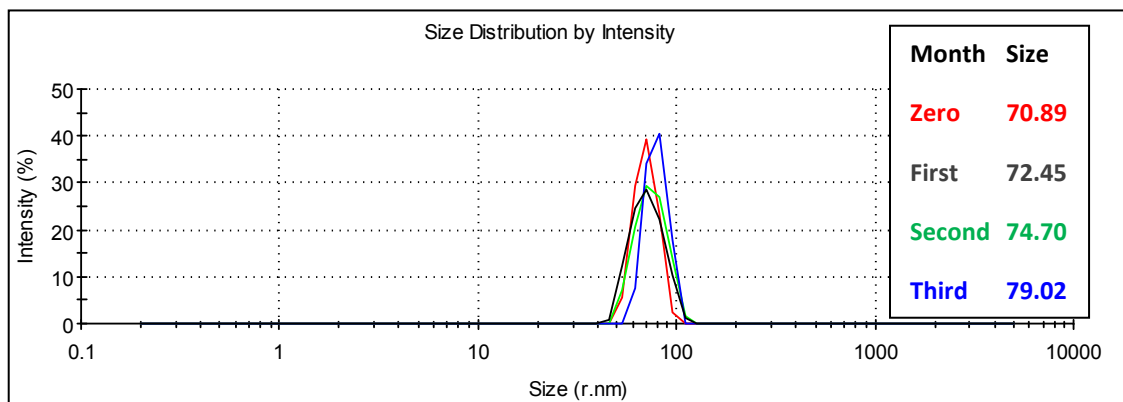


Figure S3 Change in HD size of DOX loaded particles with time

Figure S4

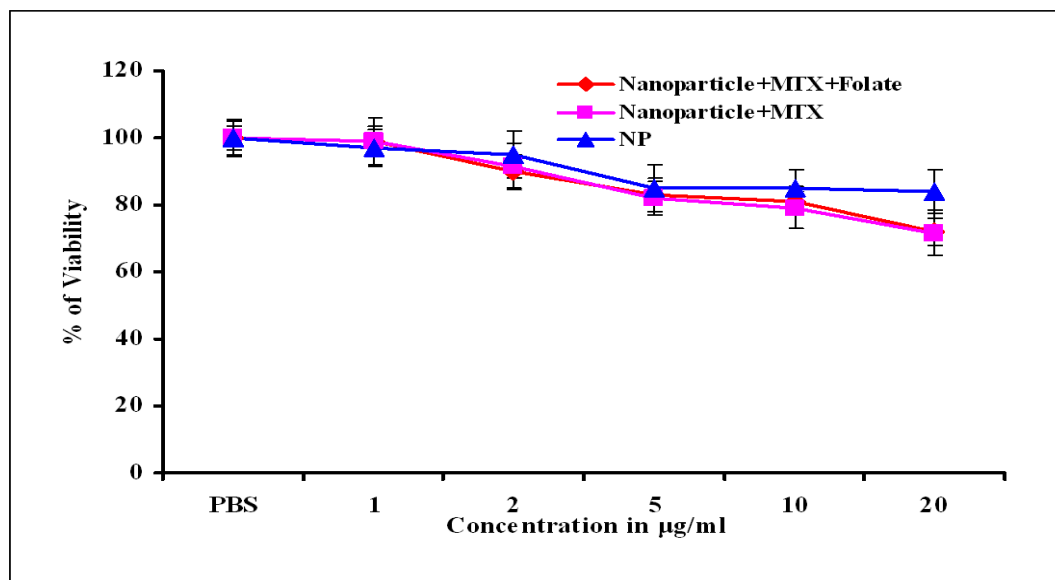


Figure S4 Cytotoxicity assay of nanoparticles on NIH/3T3 cells. Cells were treated with different concentrations of nanoparticles for 72 h and cell viability was measured by MTT assay.

Figure S5

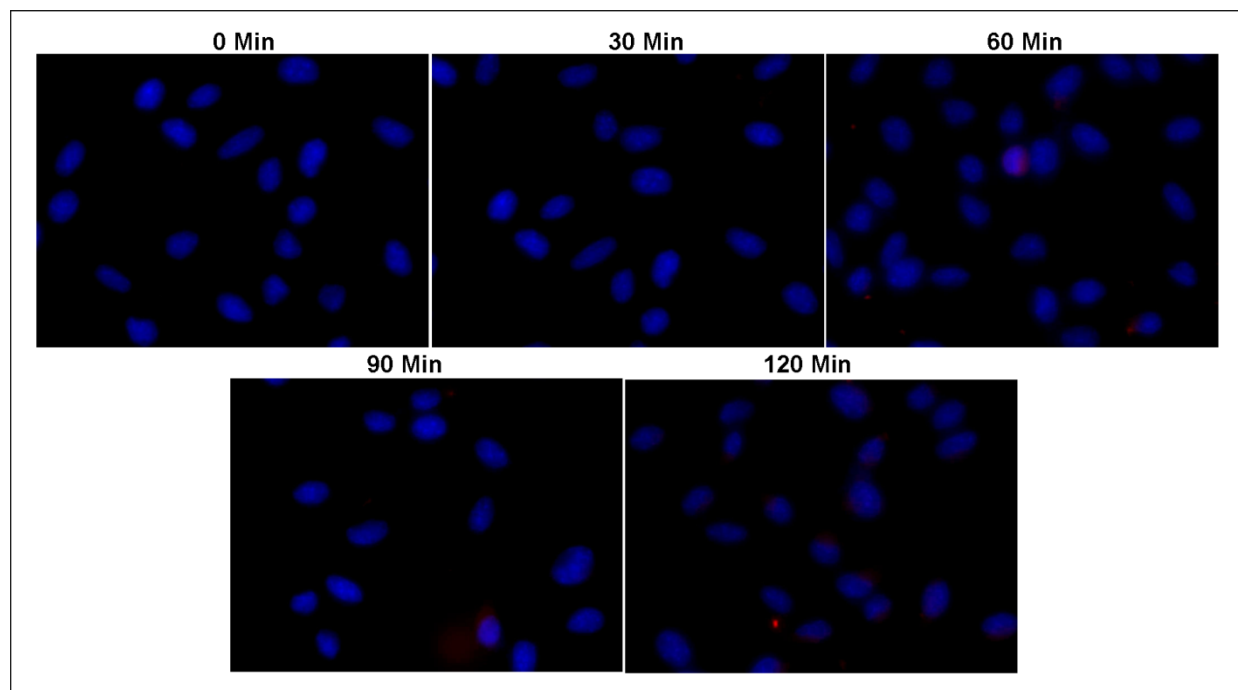


Figure S5 Uptake study of nanoparticle in NIH/3T₃ cells using fluorescence microscopy. Cells were incubated with CoFe₂O₄-FA-RITC-MTX nanoparticles for different time intervals and observed under fluorescence microscope (200X).

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 ($\lambda_{\text{MTX}} = 270 \text{ nm}$, $\lambda_{\text{DOX}} = 255 \text{ nm}$), 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

$$\begin{aligned} \text{Drug-loading content (\%)} &= \frac{\text{Weight of the drug in nanoparticles}}{\text{weight of the nanoparticles}} \times 100 \dots\dots(1) \\ &= \frac{0.00944}{0.0697} \times 100 \\ &= 13.54 \% \end{aligned}$$

$$\begin{aligned} \text{Encapsulation efficiency (\%)} &= \frac{\text{Weight of the drug in nanoparticles}}{\text{Weight of the feeding drug}} \times 100 \dots\dots\dots (2) \\ &= \frac{0.00944}{0.0118} \times 100 = 80\% \end{aligned}$$

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 ₂ O ₄	490	----	----	----	----	----
CoFe ₂ O ₄ -FA	352.8	120	----	----	ND	ND
CoFe ₂ O ₄ -FA-RITC	321.9	120	46	ND	ND	ND
CoFe ₂ O ₄ -FA-RITC-MTX	40.8	120	46	280	ND	ND
CoFe ₂ O ₄ -FA-COOH	34	120	46	----	325	----
CoFe ₂ O ₄ -FA-DOX	34	112	46	----	25	298

Reference

1. Wang Wei, Zou M, and Chen K, Novel Fe₃O₄@YPO₄: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.