Electronic Supplementary Information

Facile preparation of hyaluronic acid and transferrin co-modified Fe_3O_4 nanoparticles with inherent biocompatibility for dual-targeting magnetic resonance imaging of tumors *in vivo*

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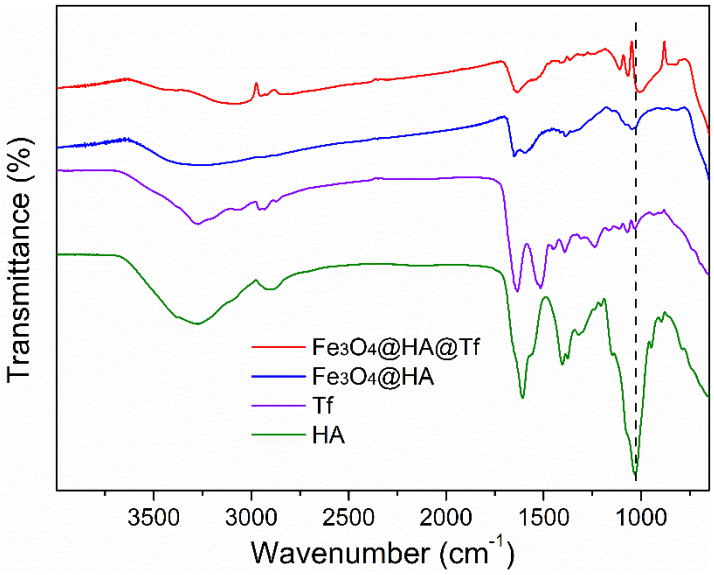

Fig. S1 FT-IR spectra of Fe_3O_4@HA@Tf NPs, Fe_3O_4@HA NPs, Tf and HA.

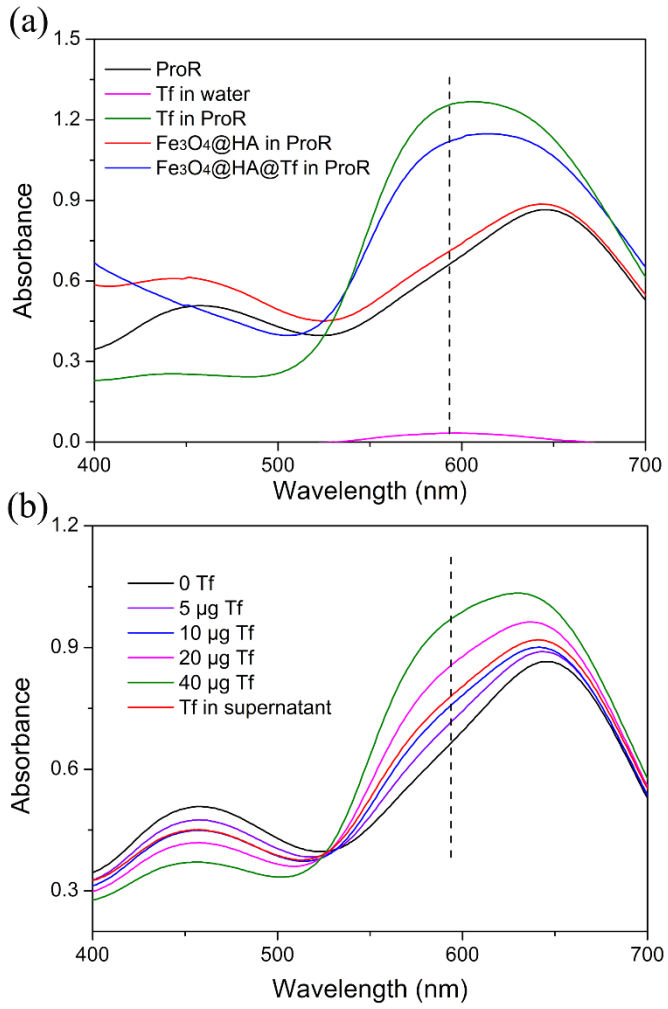

Fig. S2 UV-vis-NIR absorption spectra of different solutions in Bradford

protein assay. (a) ProR, Tf in water, Tf in ProR, Fe_3O_4@HA@ NPs in ProR and Fe_3O_4@HA@Tf NPs in ProR; (b) Various concentrations of Tf in ProR and supernatant containing unreacted Tf in ProR. ProR meant protein reagent was prepared according to Bradford protein assay: 5 mg of coomassie brilliant blue G-250 was dissolved in the mixture of ethanol and phosphoric acid, then the resulted solution was diluted to a final volume of 50 mL for subsequent use. The mixture of ProR and Tf induced a strong absorption at 595 nm due to the special interaction between them. The mixture of ProR and Fe_3O_4@HA@Tf NPs showed an obviously increasing absorption at 595 nm compared with the spectra of ProR itself. However, the mixture of ProR and Fe_3O_4@HA NPs presented negligible increasing absorption at 595 nm (a). So it could be concluded that the Tf was successfully modified on the surface of Fe_3O_4@HA NPs. To further determine the content of Tf in the Fe_3O_4@HA@Tf NPs, the concentration of free Tf in the supernatant after the conjugation reaction was calculated according to the standard curve of absorbance at 595 nm of Tf in ProR (b). Then the amount of conjugated Tf was deduced by subtracting the amount of free Tf from the amount of added Tf.

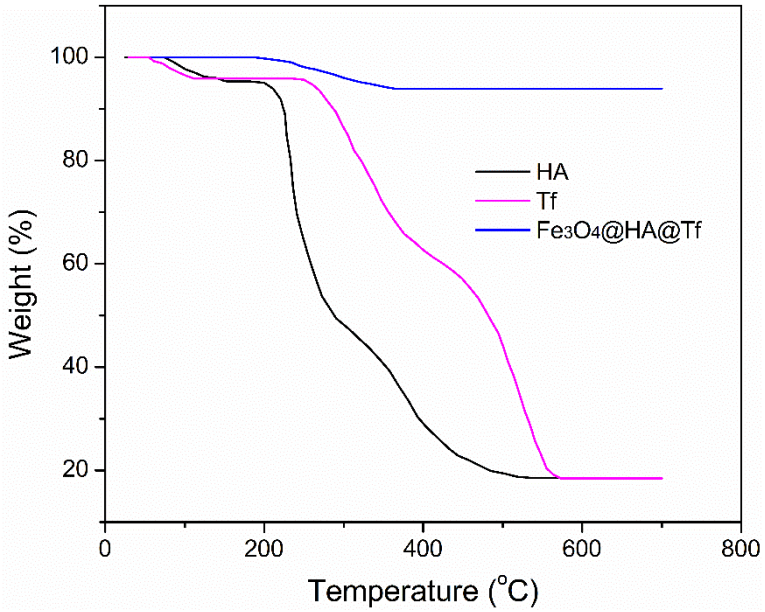

Fig. S3 TGA curves of Fe_3O_4@HA@Tf NPs, HA and Tf, respectively.

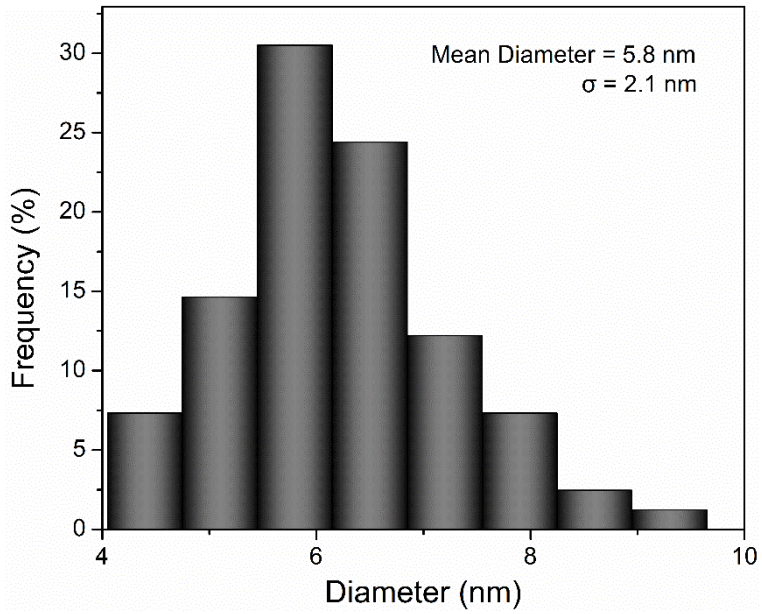

Fig. S4 Size distribution of Fe_3O_4@HA@Tf NPs via the characterization of HRTEM.

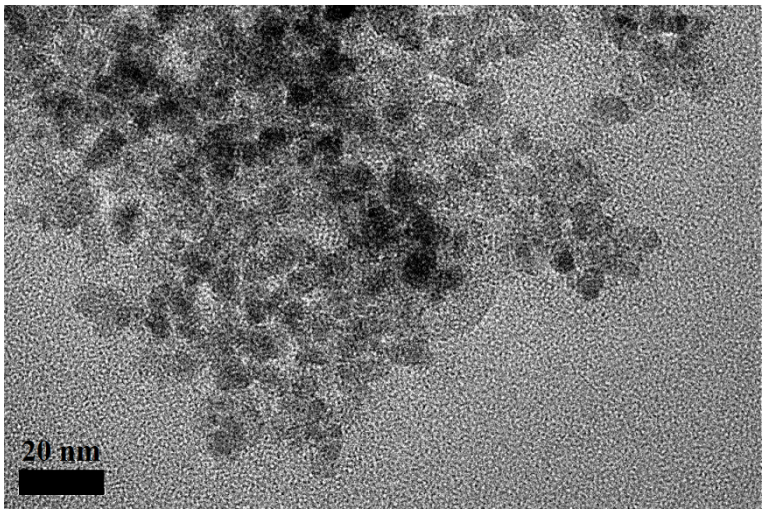

Fig. S5 HRTEM image of Fe_3O_4@HA NPs.

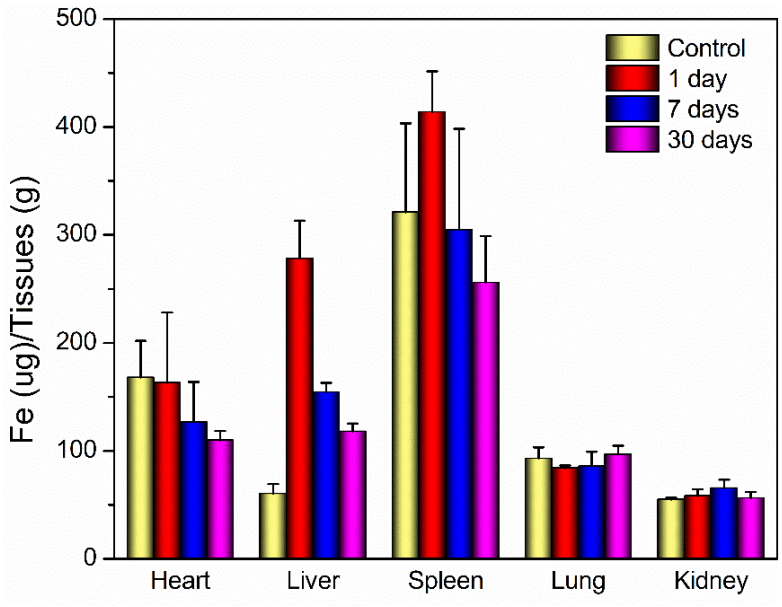

Fig. S6 Distribution of Fe in different organs of mice at different time points (1, 7, 30 days) after intravenous administration of Fe_3O_4@HA@Tf NPs in PBS (24 mg Fe/kg). Mice without treatments of the nanoprobe were regarded as control group, n=3.

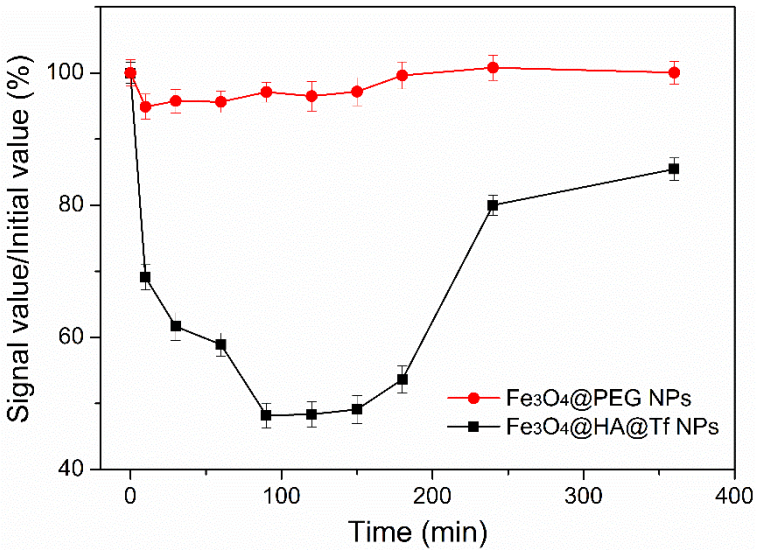

Fig. S7 The changes of MR signal intensity of tumor sites before and after administration of Fe_3O_4@HA@Tf NPs and Fe_3O_4@PEG NPs in PBS (24 mg Fe/kg) at different time points post-injection of the nanoprobes, respectively.

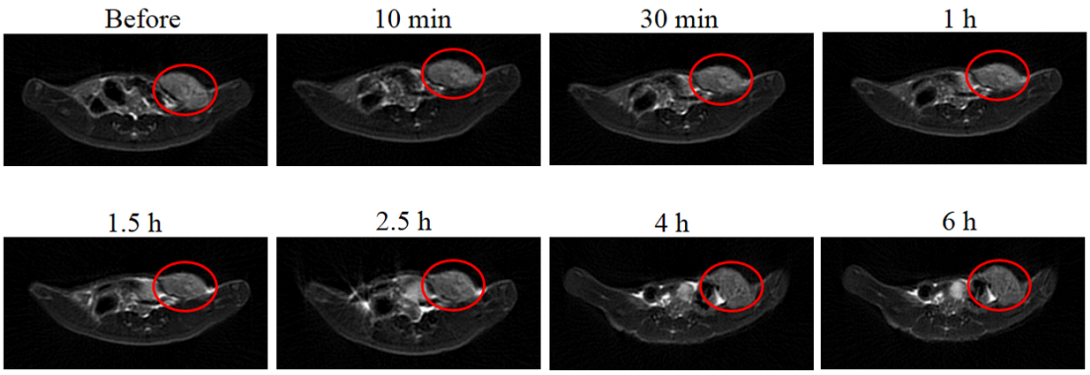

Fig. S8 T_2-weighted MR images of tumor-bearing mouse before and after intravenous administration of Fe_3O_4@PEG NPs in PBS (24 mg Fe/kg) at different time points. The region with red cycle was tumor site.

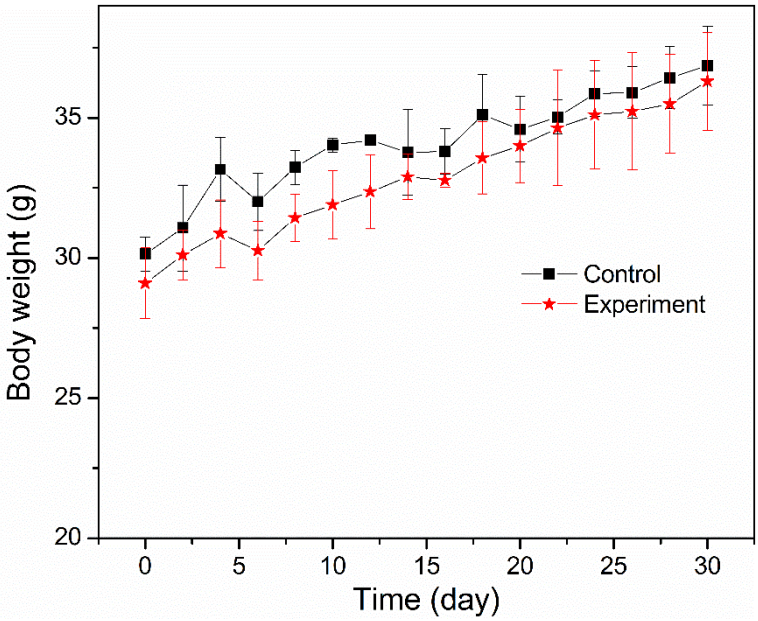

Fig. S9 Body weight of mice after intravenous administration of Fe_3O_4@HA@Tf NPs in PBS (24 mg Fe/kg), n=3.