Supplementary Material

The Bioavailability, Biodistribution and Toxic Effects of Silica-coated Upconversion Nanoparticles *in Vivo*

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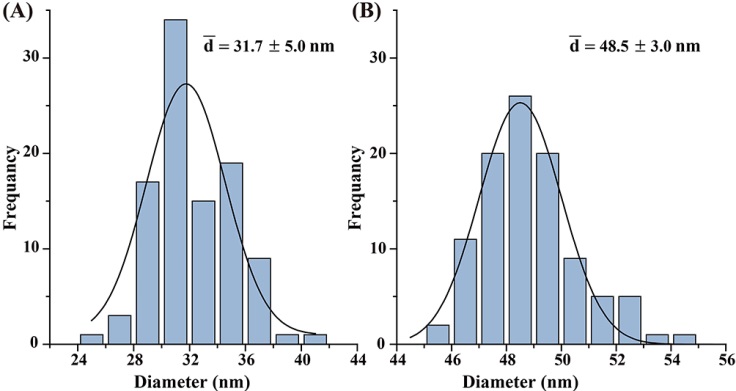
**Table S1.** Composition of simulated body fluid (amounts based on 1000 mL of juice) (Tang et al., 2016).

| Name | Reagent | Content |
| --- | --- | --- |
| SBF  (pH = 7.4) | NaCl | 8.035 g |
| NaHCO3 | 0.355 g |
| KCl | 0.225 g |
| K2HPO4·3H2O | 0.231 g |
| MgCl2·6H2O | 0.311 g |
| 1.0 M HCl | 39 mL |
| CaCl2 | 0.292 g |
| Na2SO4 | 0.072 g |
| Tris | 6.118 g |
| 1.0 M HCl | 0-5 mL |

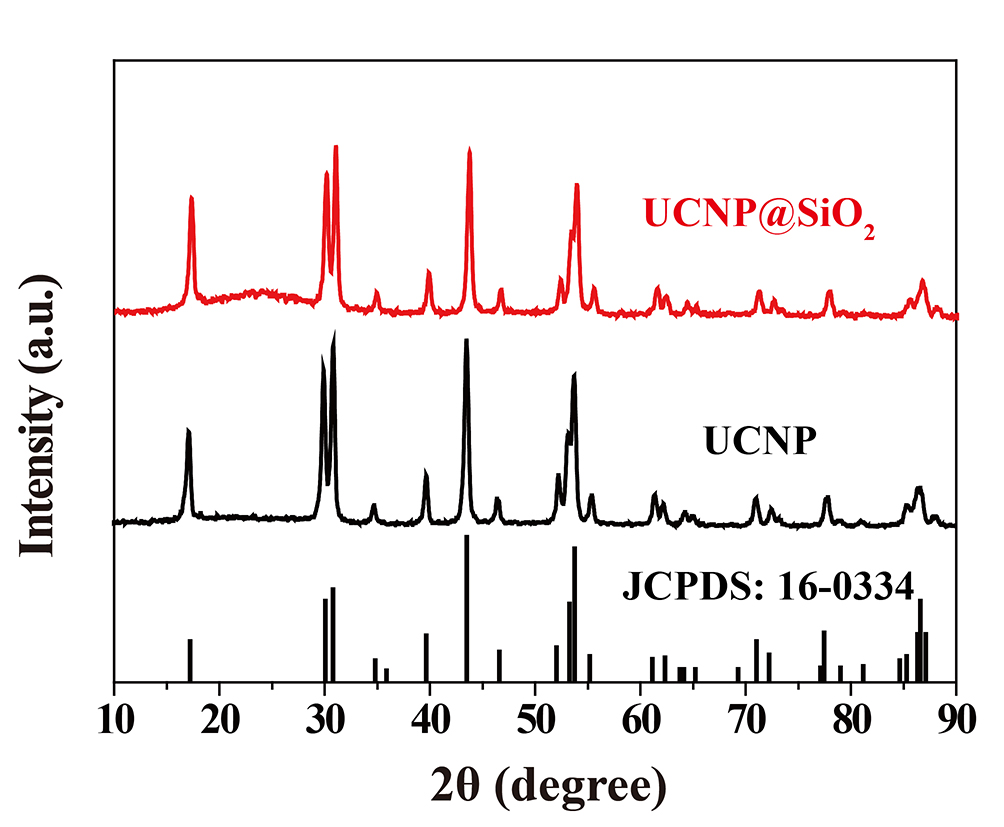
Tang, H., Yang, S. T., Yang, Y. F., Ke, D. M., Liu, J. H., Chen, X., et al. (2016). Blood clearance, distribution, transformation, excretion, and toxicity of near-infrared quantum dots Ag2Se in mice. *ACS Appl. Mater. Interfaces* 8, 17859−17869. doi: 10.1021/acsami.6b05057.

**Table S2.** Biochemical parameters of serum in the mice after consecutive gavage administration of NaYF4:Yb,Er@SiO2. \*Significant difference vs the corresponding control (P<0.05, n = 3).

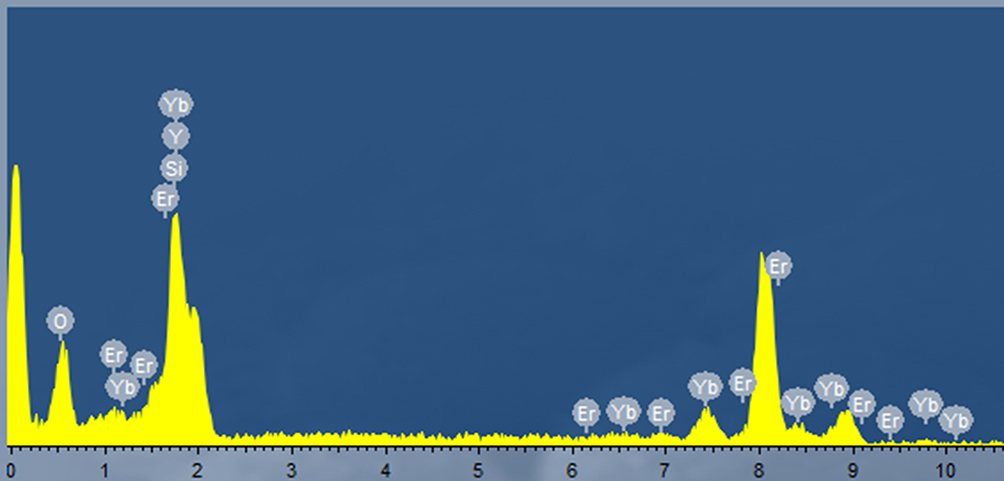
| *Parameter* | 7 Day | | | 14 Day | | |
| --- | --- | --- | --- | --- | --- | --- |
| 0 mg/kg | 20 mg/kg | 100 mg/kg | 0 mg/kg | 20 mg/kg | 100 mg/kg |
| ALT  (IU/L) | 26.3±5.7 | 27.0±7.0 | 26. 7±4.2 | 31.3±4.2 | 33.0±7.2 | 32.0±6.2 |
| AST  (IU/L) | 108.3±22.2 | 80.3±17.9 | 113.3±29.7 | 111.0±8.7 | 91.3±18.0 | 103.3±18.1 |
| ALP  (IU/L) | 406.0±78.0 | 459.0±49.9 | 535.3±127.1 | 456.7±88.8 | 321.7±36.0 | 474.3±78.4 |
| BUN  (mmol/L) | 6.9±0.5 | 8.4±0.4\* | 9.3±1.5\* | 8.7±1.0 | 8.3±1.3 | 8.5±1.5 |
| Crea  (μmol/L) | 9.7±1.1 | 10.0±1.7 | 10.3±1.5 | 12.3±0.6 | 11.3±1.2 | 10.0±1.0\* |

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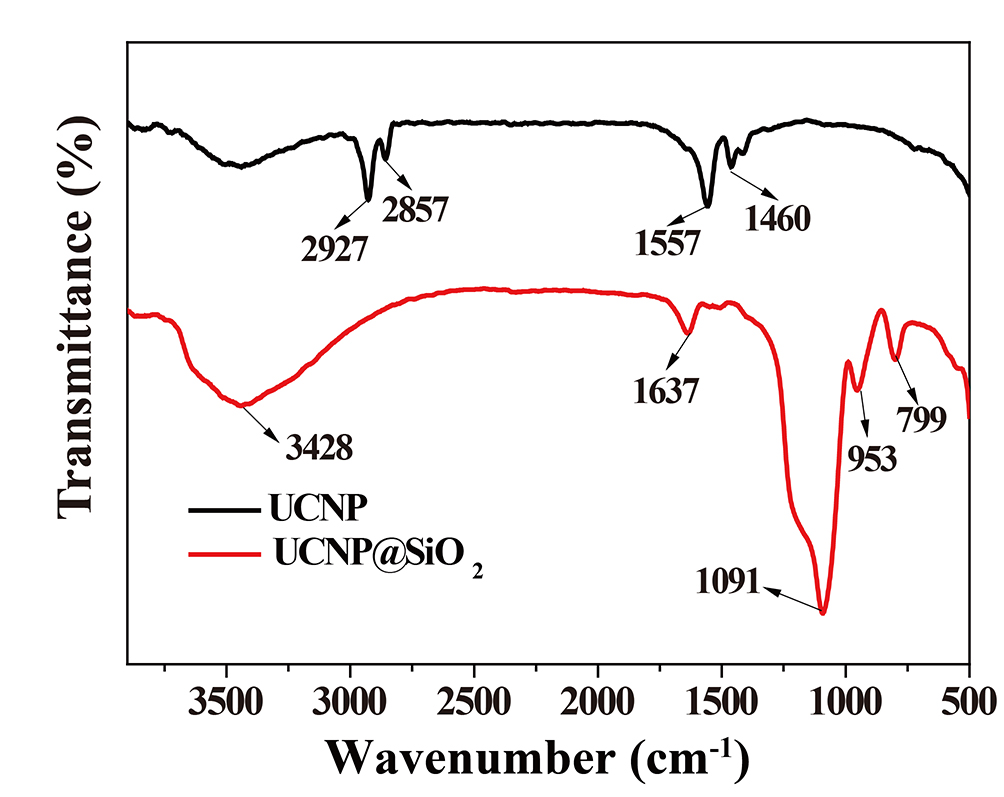
**Figure S1.** Size distribution of NaYF4:Yb,Er (A) and NaYF4:Yb,Er@SiO2 (B) nanoparticles measured by Image J software.



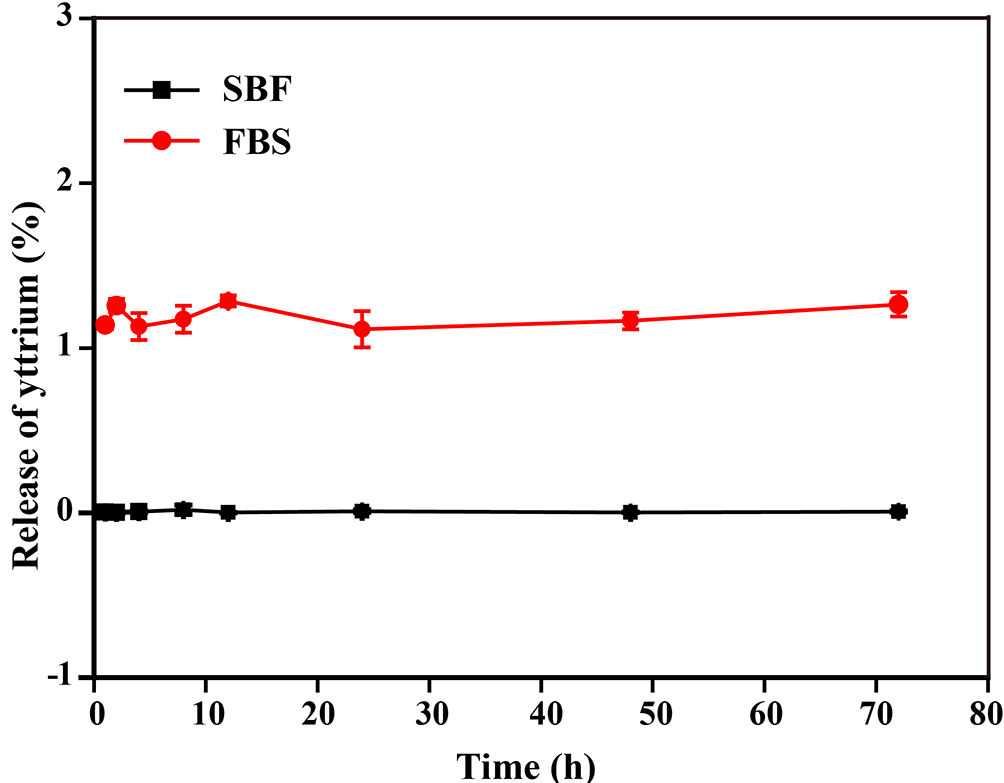
**Figure S2.** XRD patterns of NaYF4:Yb,Er, NaYF4:Yb,Er@SiO2, and the standard card of hexagonal NaYF4 (JCPDS: 16-0334). UCNP denotes NaYF4:Yb,Er. UCNP@SiO2 denotes NaYF4:Yb,Er@SiO2.



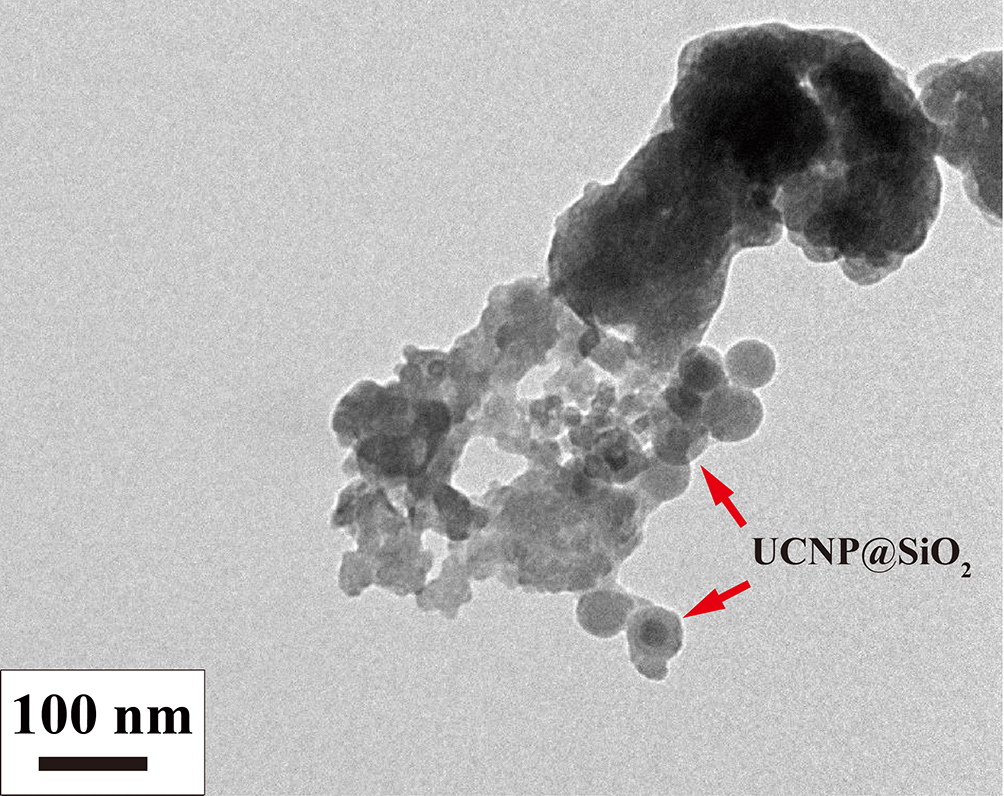
**Figure S3.** Energy dispersive X-ray (EDX) spectrum of NaYF4:Yb,Er@SiO2.



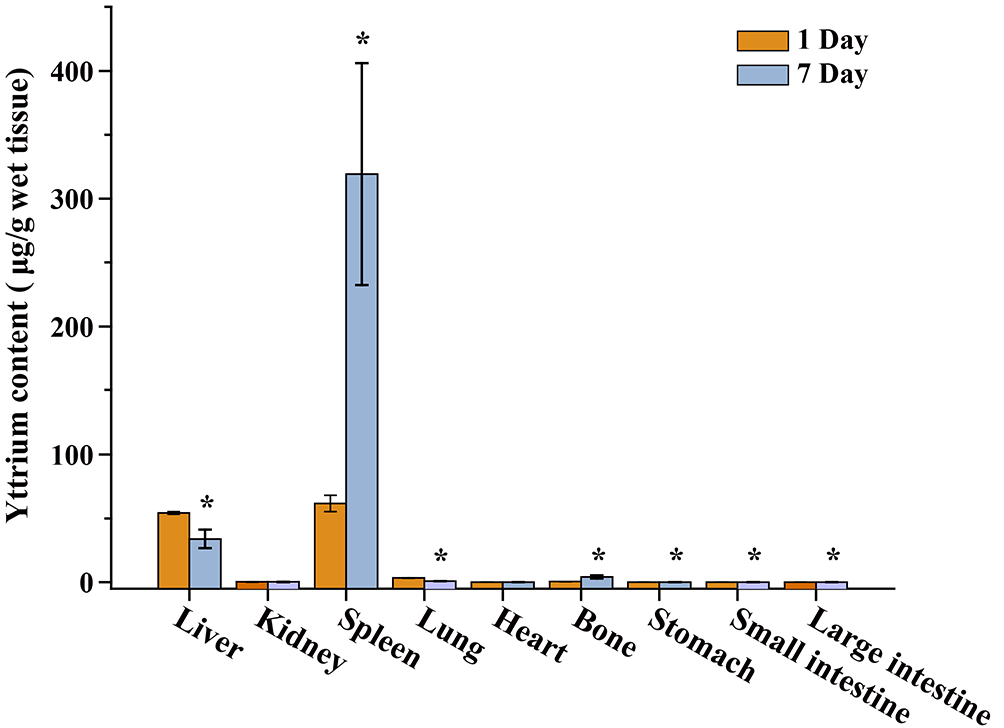
**Figure S4.** FT-IR spectra of the oleic acid coated NaYF4:Yb,Er and NaYF4:Yb,Er@SiO2. UCNP denotes oleic acid capped NaYF4:Yb,Er. UCNP@SiO2 denotes NaYF4:Yb,Er@SiO2.



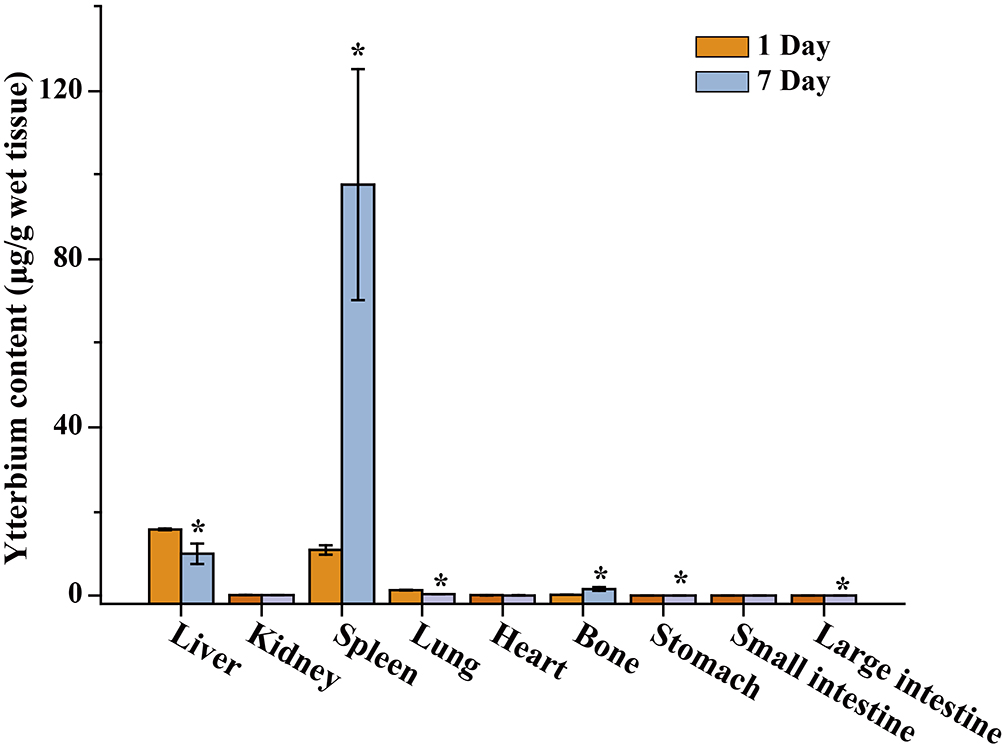
**Figure S5.** The release of yttrium from NaYF4:Yb,Er@SiO2 in SBF and FBS.

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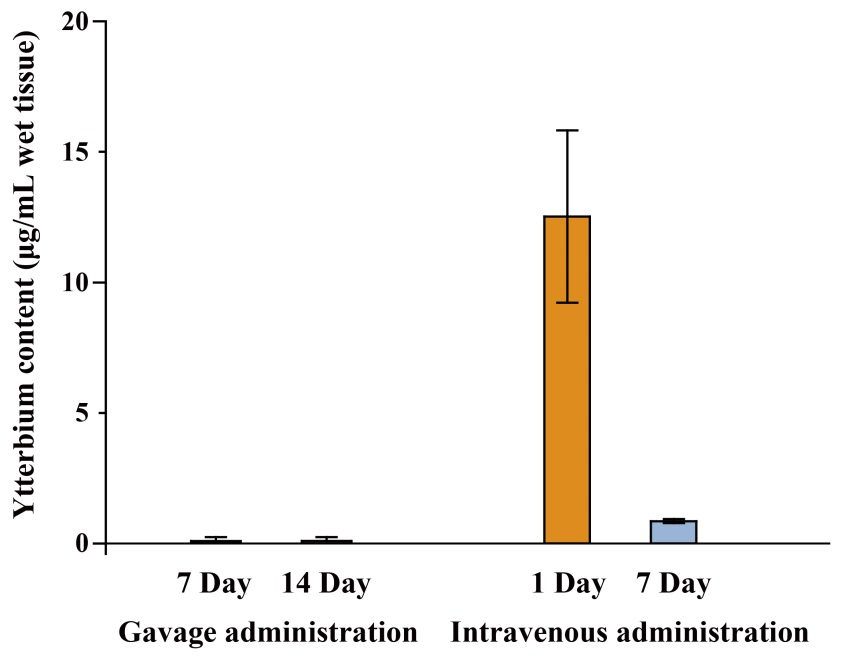
**Figure S6.** TEM image of NaYF4:Yb,Er@SiO2 in feces collected on the 14th day after mice were administrated consecutively with NaYF4:Yb,Er@SiO2 by gavage method. UCNP@SiO2 denotes NaYF4:Yb,Er@SiO2.

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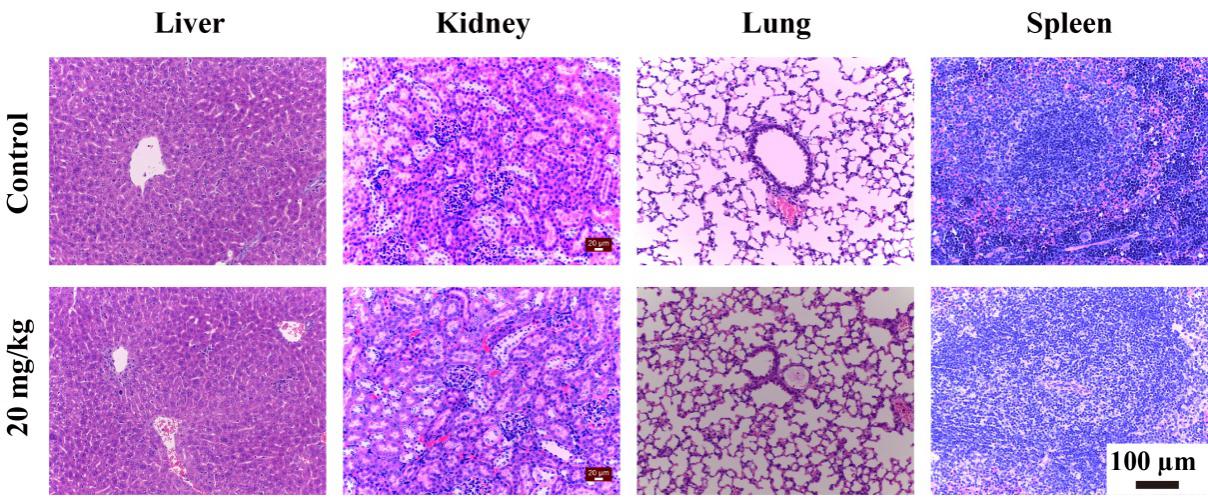
**Figure S7.** Yttrium content in the tissues of mice at day 1 and day 7 after a single intravenous administration of NaYF4:Yb,Er@SiO2, respectively. \*Significant difference between the two treatment groups (P<0.05, n = 3).



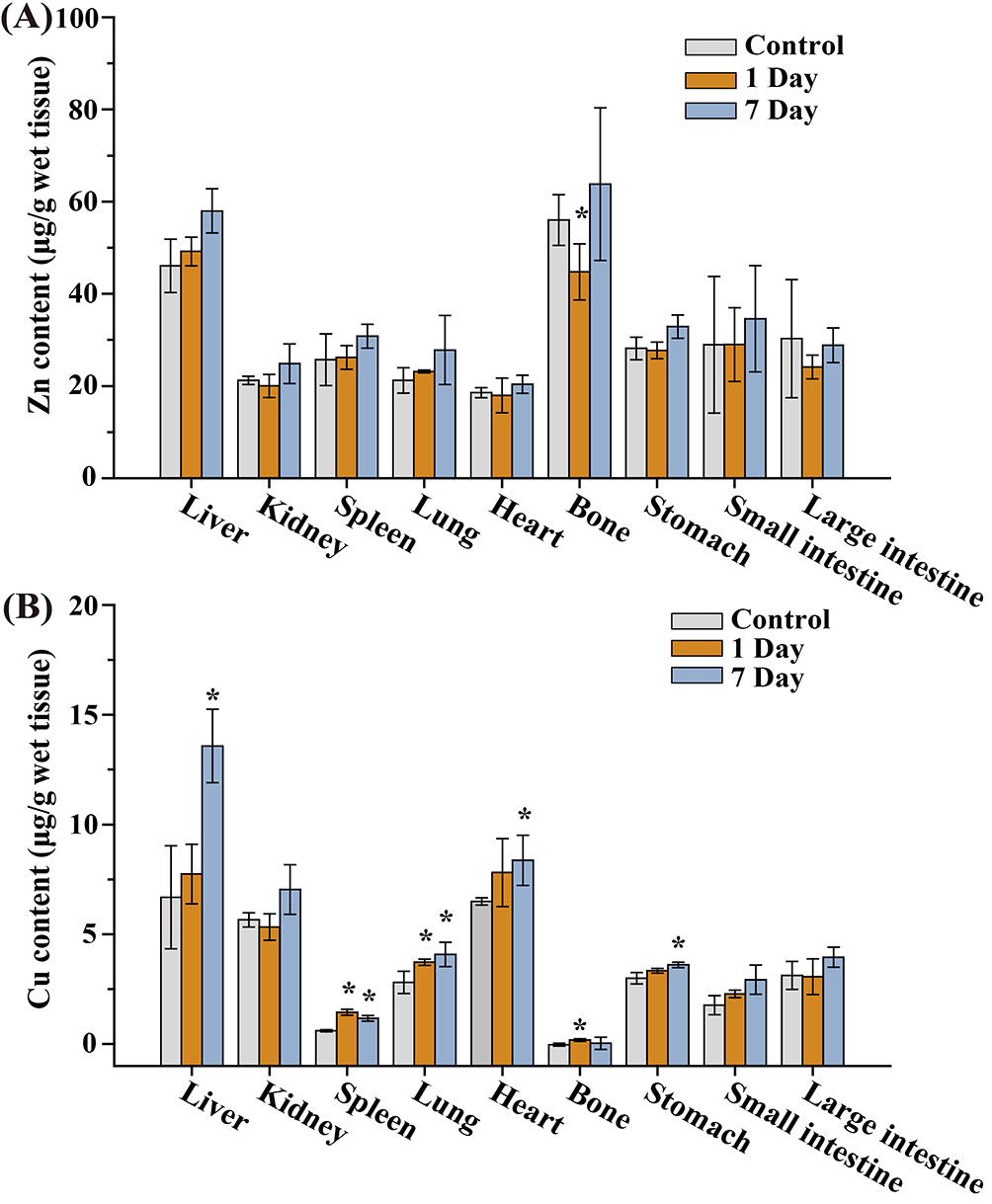
**Figure S8.** Ytterbium content in the tissues of mice at day 1 and day 7 after a single intravenous administration of NaYF4:Yb,Er@SiO2, respectively. \*Significant difference between the two treatments groups (P<0.05, n = 3).

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**Figure S9.** Ytterbium content in the blood of mice at day 7 and 14 at a dose of 20 mg/kg by gavage method and at day 1 and day 7 after a single intravenous administration of these nanoparticles with a dose of 20 mg/kg, respectively (n = 3).



**Figure S10.** Histopathological observation of liver, kidney, lung and spleen of mice at day 1 after intravenous administration of NaYF4:Yb,Er@SiO2 into mice with a dose of 20 mg/kg.



**Figure S11.** Zinc (A) and copper (B) content in the tissues of mice at day 1 and day 7 after a single intravenous administration of UCNP@SiO2. \*Significant difference vs the corresponding control (P<0.05, n = 3).