Electronic Supplementary Material (ESI) for RSC Advances.


# *In vivo* biodistribution and passive accumulation of upconversion nanoparticles in colorectal cancer models via intraperitoneal injection

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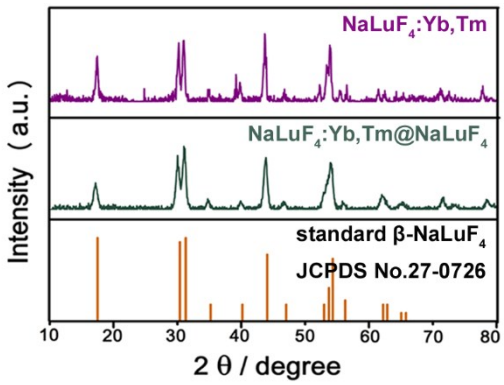


**Figure S1** X-ray diffraction patterns of as-prepared $NaLuF_4$:Yb,Tm, cit-$NaLuF_4$:Yb,Tm@$NaLuF_4$ samples, and standard data of hexagonal-phase β-$NaLuF_4$ (JCPDS No.27-0726).

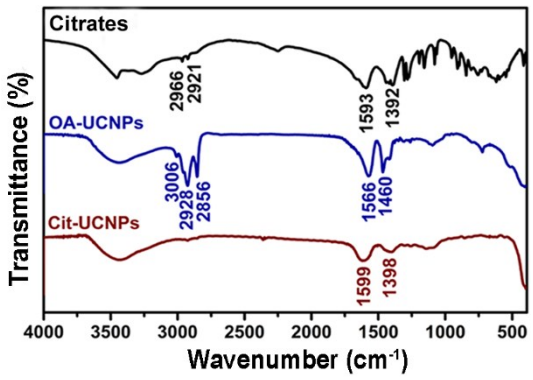


**Figure S2** Fourier-transform infrared spectra of citrates, OA-$NaLuF_4$:Yb,Tm@$NaLuF_4$ and cit-

$NaLuF_4$:Yb,Tm@$NaLuF_4$.

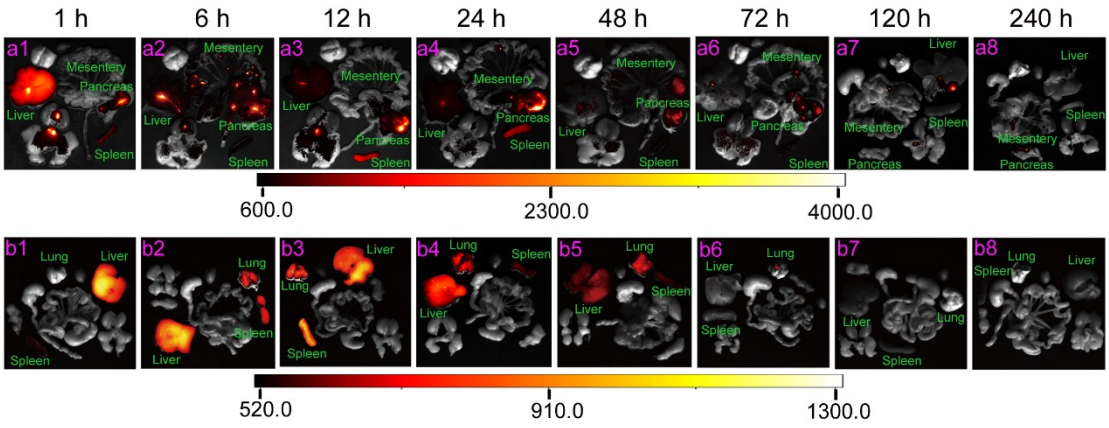


**Figure S3** *Ex vivo* images of the normal male mice injected with cit-$NaLuF_4$:Yb,Tm@$NaLuF_4$ via intraperitoneal (a1 - a8) or intravenous (b1 - b8) injection within 240 h. Upconversion luminescence signals were collected at 800 ± 12 nm under excitation with CW 980 nm laser.

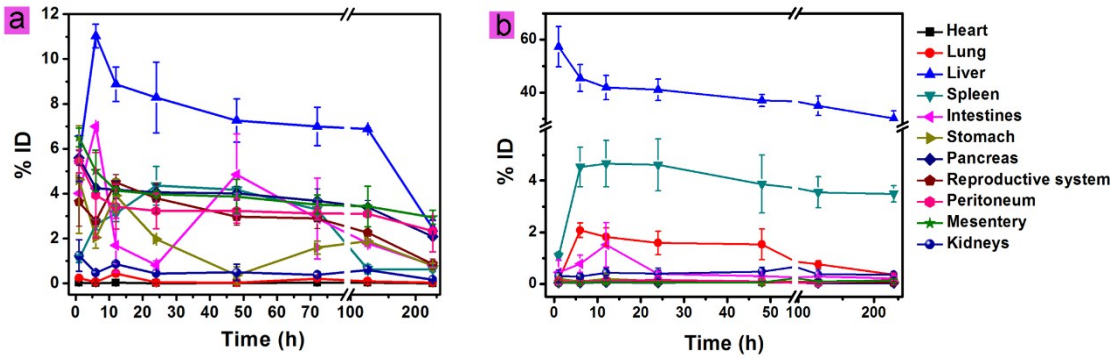


**Figure S4** Mass accumulation (% ID) of $Lu^{3+}$ in the main tissues at various time points (1 h, 6 h, 12 h, 24 h, 48 h, 72 h, 120 h and 240 h) after intraperitoneal (IP, a) or intravenous (IV, b) injection of cit-$NaLuF_4$:Yb,Tm@$NaLuF_4$ (16 mg/kg wt) into the normal male mice (n=3). % ID of $Lu^{3+}$ was calculated by comparing the total amount of $Lu^{3+}$ in each tissue with standard of injected dose (ID).

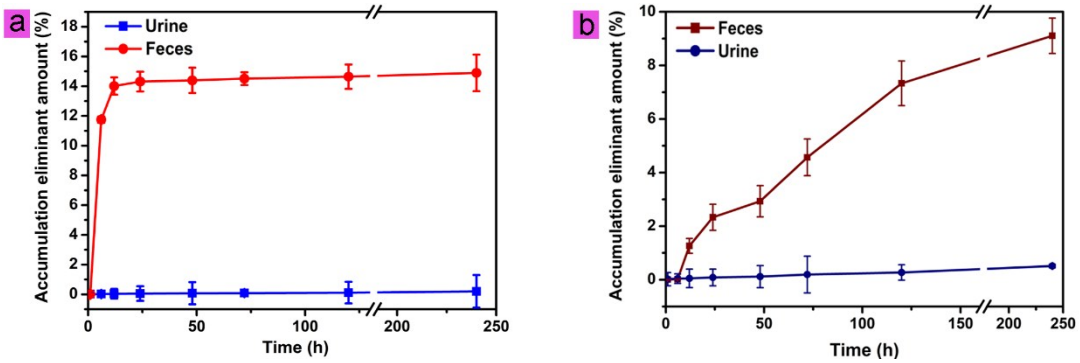


**Figure S5** Accumulation eliminant curve of cit-$NaLuF_4$:Yb,Tm@$NaLuF_4$ via intraperitoneal (a) or intravenous (b) injection in the normal male mice within 240 h (16 mg/kg wt).

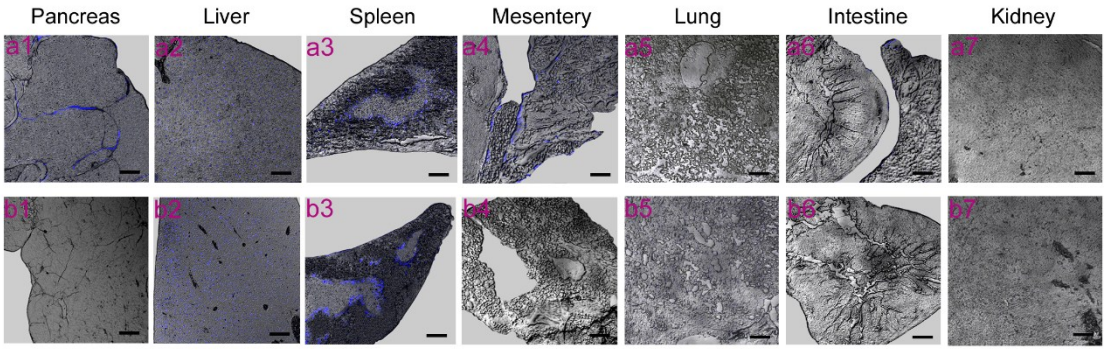


**Figure S6** Accumulation pattern of cit-$NaLuF_4$:Yb,Tm@$NaLuF_4$ in the pancreas (a1, b1), the liver (a2, b2), the spleen (a3, b3), the mesentery (a4, b4), the lung (a5, b5), the intestine (a6, b6) and the kidney (a7, b7) at 6 h after intraperitoneal (a) or intravenous (b) injection in the normal male mice. Upon excitation at 980 nm, luminescence signals were collected in the channel of 400 - 500 nm.

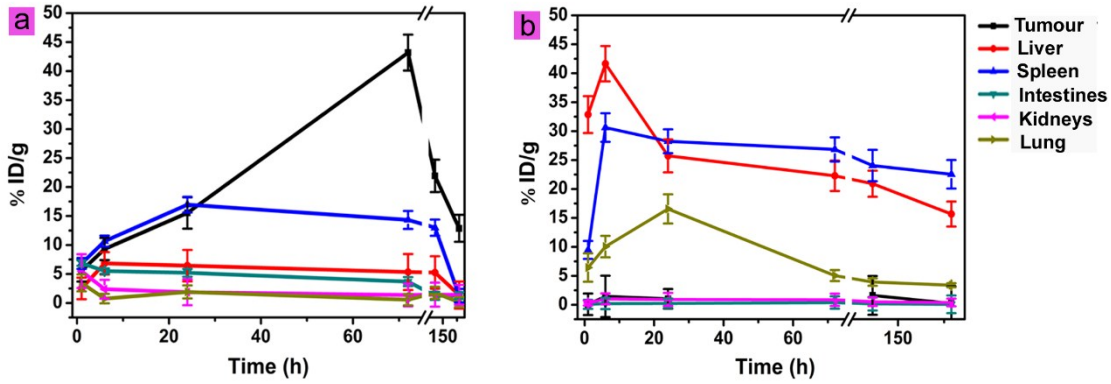


**Figure S7** Unit mass accumulations (%ID/g) of $Lu^{3+}$ in the main normal organs and the tumours via intraperitoneal (a) or intravenous (b) injection of cit-$NaLuF_4$:Yb,Tm@$NaLuF_4$ (16 mg/kg wt) into the colorectal cancer models at various time points (1 h, 6 h, 24 h, 72 h, 120 h and 240 h) (n=3).

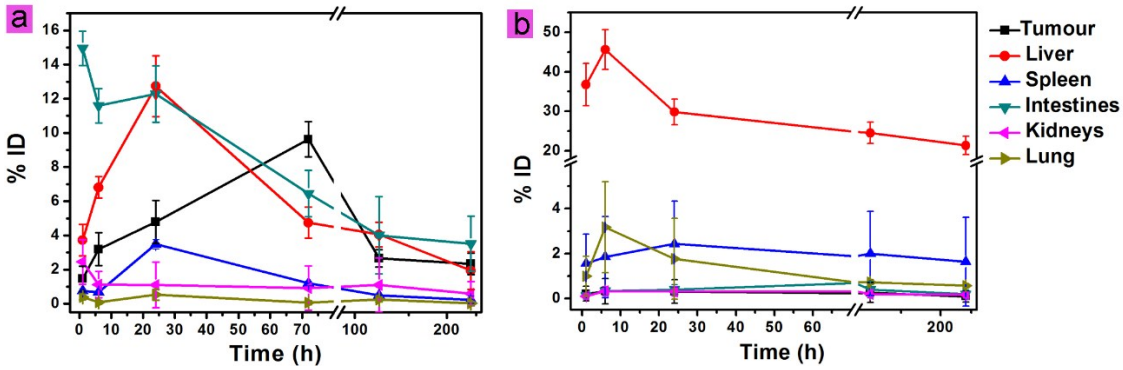


**Figure S8** Mass accumulations (%ID) of $Lu^{3+}$ in the main normal organs and the tumours via intraperitoneal (a) or intravenous (b) injection of cit-$NaLuF_4$:Yb,Tm@$NaLuF_4$ (16 mg/kg wt) into the colorectal cancer models at various time points (1 h, 6 h, 24 h, 72 h, 120 h and 240 h) (n=3).