**Facile synthesis of Holmium-based nanoparticles as a CT and MRI Dual-modal imaging for Cancer Diagnosis**

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**1. Characterization**

Transmission electron microscope (TEM) images were performed on a FEI Tecnai G2 F20 microscope. Field emission scanning electron microscope (FESEM) images were analyzed on a Hitachi S-4800 microscope. X-ray powder diffraction (XRD) of the samples was examined on a D8 Focus diffractometer (Bruker., Germany) using Cu-Ka radiation (0.15405 nm). The concentration of the nanomaterial was obtained by inductively coupled plasma-mass spectrometry (ICP-MS). X-ray photoelectron (XPS) measurements were performed on an ESCALAB-MKII spectrometer (VG Co., United Kingdom). IR measurements were performed on a fourier transform infrared spectrometer (Bruker., Germany). Zeta potential and DLS were analyzed on a Zetasizer Nano (Malvern., England). CT was performed by a 256-slice CT scanner (Brilliance iCT, Philips Healthcare). MR Imaging was performed on a 3.0 T human clinical MRI scanner (Ingenia 3.0T CX, Philips Healthcare).

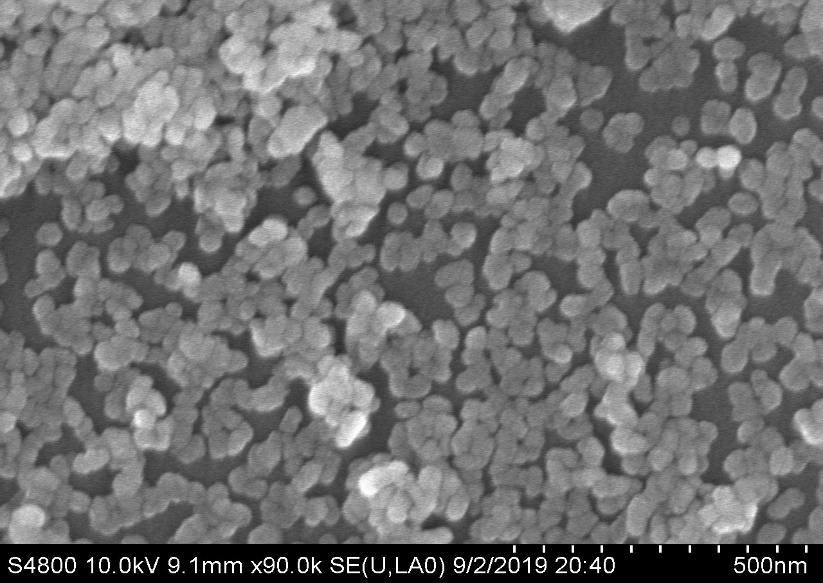


Figure S1. SEM image of PEG-HoF3 NPs and the average size is about 38 nm.

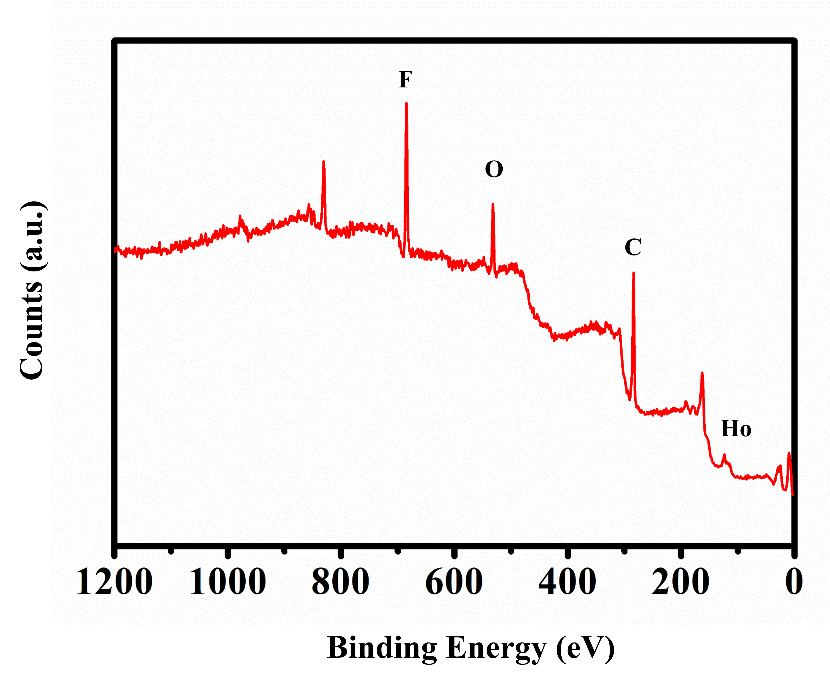


Figure S2. XPS wide scan of PEG-HoF3 NPs.



**-OH**

Figure S3. The peak in 3391 cm-1 verify the existence of PEG.



Figure S4. From the left to right are PEG-HoF3 NPs in water, normal saline and PBS solution.

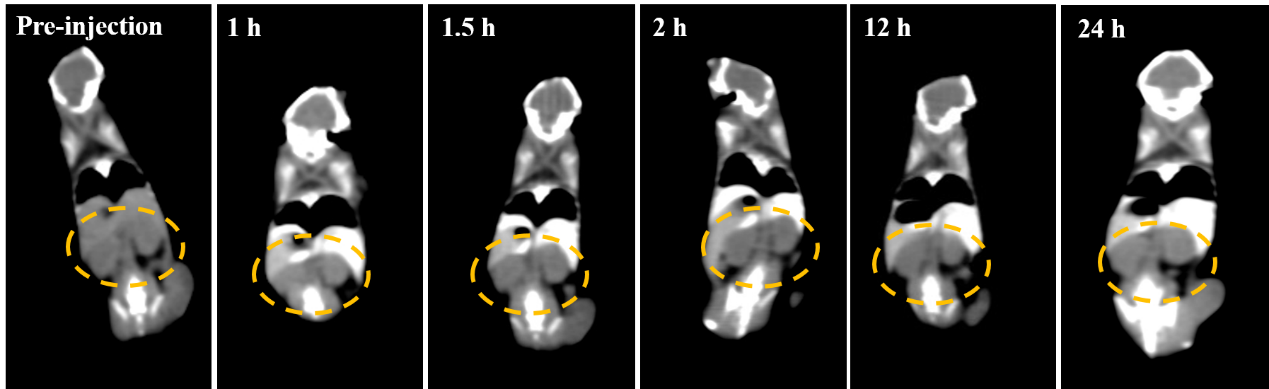


Figure S5. CT images of mouse kidney in different time point after intravenous injection of PEG-HoF3 NPs. Yellow circle indicates the kidney.