Supporting Information

A Smart Theranostic Platform for Photoacoustic and Magnetic Resonance Dual-imaging-guided Photothermal-Enhanced Chemodynamic therapy

Haimei Wang, Lu An, Cheng Tao, Ziyi Ling, Jiaomin Lin, Qiwei Tian* and Shiping Yang*

*E-mail: shipingy@shnu.edu.cn, qiweitian@shnu.edu.cn

Figures

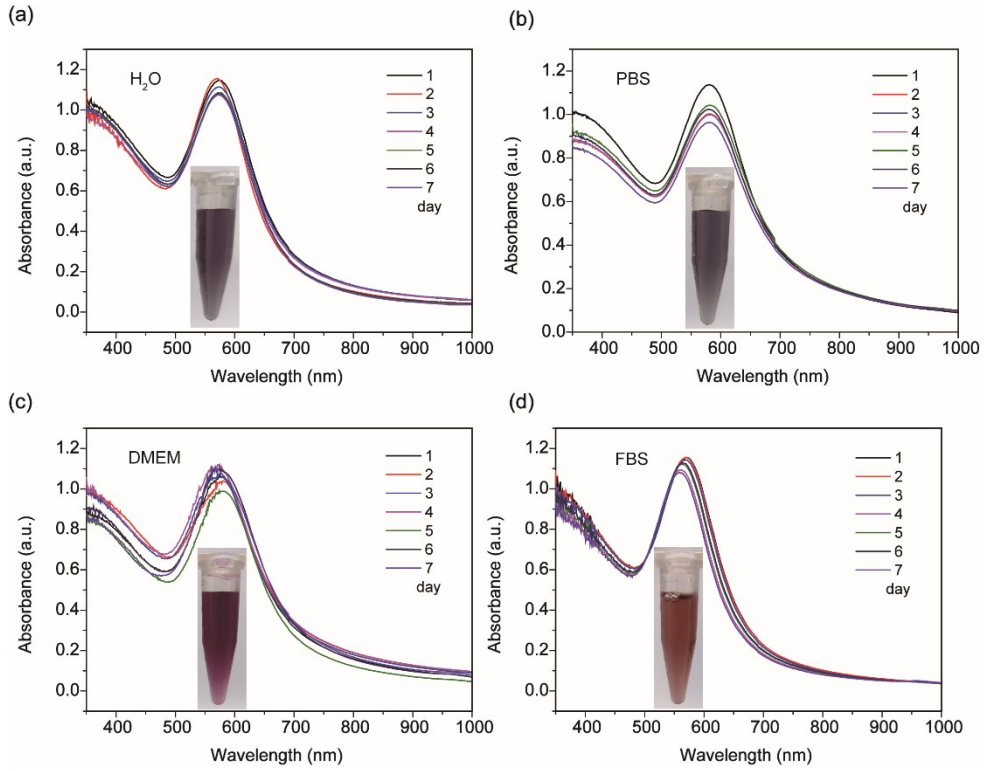

Figure S1. Stability of Au@MnO_2 dispersed in different physiological solutions within one week and corresponding photograph (inset) after one week. (a) water, (b) PBS, (c) DMEM and (d) FBS.

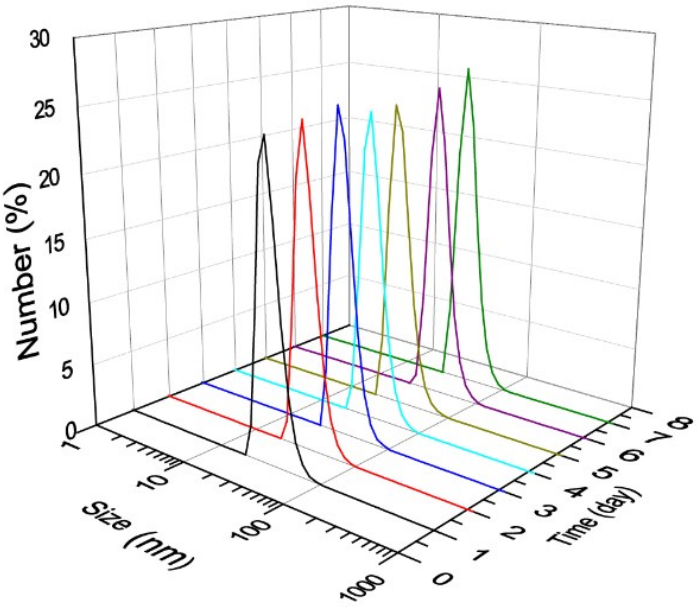

Figure S2. Hydrodynamic diameter of prepared Au nanoparticles dispersed in water over one week, indicating a good stability.

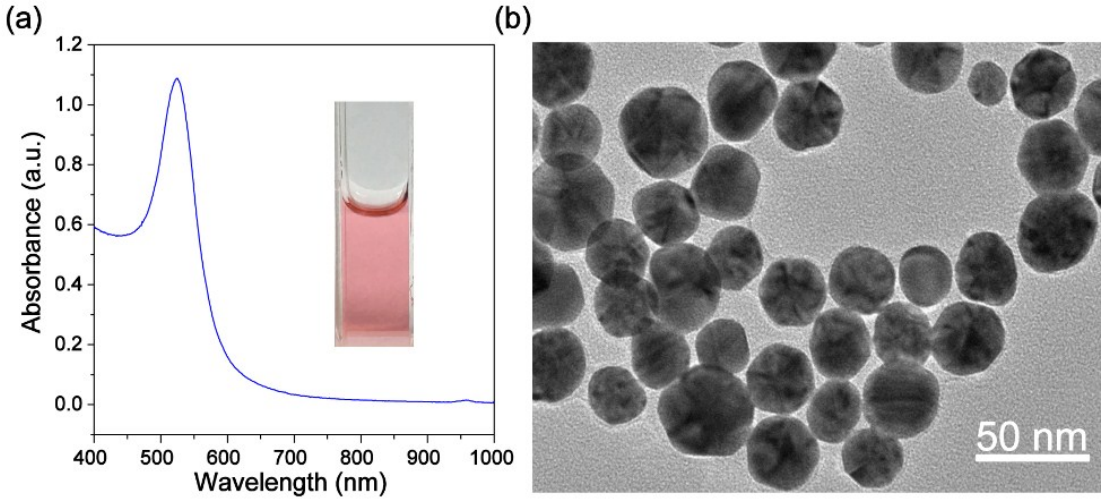

Figure S3. (a) Absorption and photograph (inset) of the Au nanosphere water disperion. (b) Transmission electron microscopy (TEM) image of the Au nanospheres.

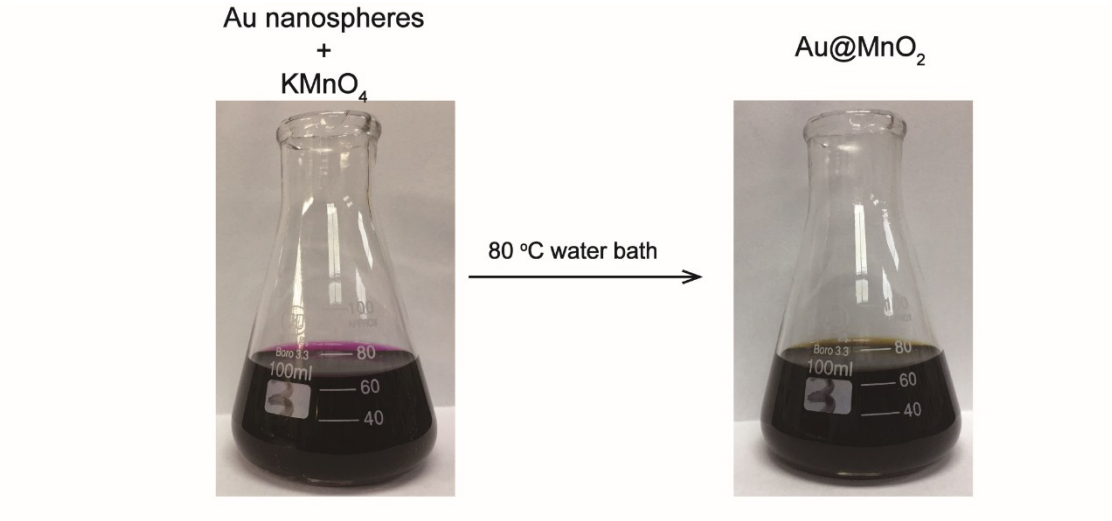

Figure S4. The preparation of $Au@MnO_2$ and the color change before and after reaction.

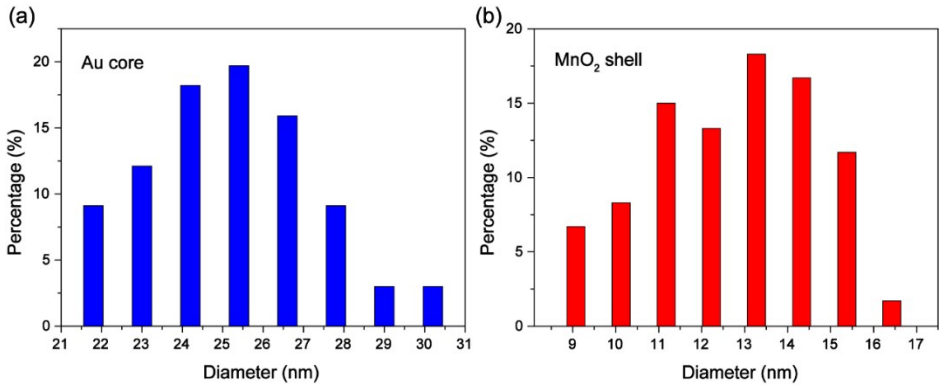

Figure S5. (a) The size distribution of the gold (Au) core. (b) The thickness of the manganese dioxide (MnO_2) shell.

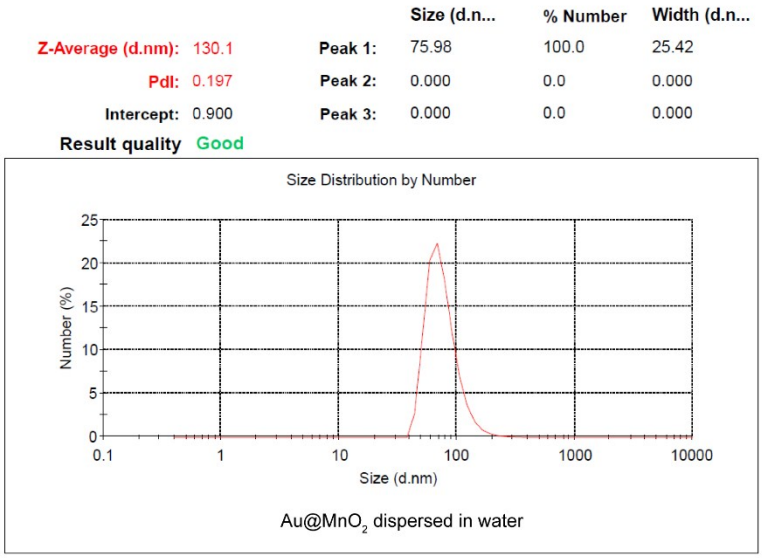

Figure S6. The Hydrodynamic diameter of prepared $Au@MnO_2$ collected by dynamic light scattering.

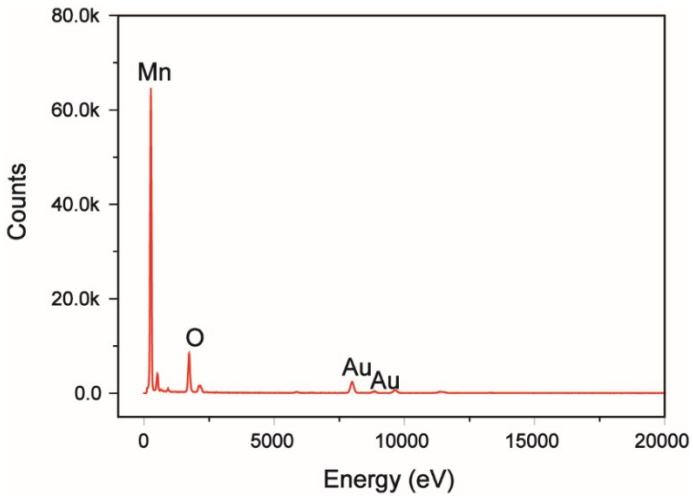

Figure S7. EDS spectrum of Au@MnO_2 nanoparticles.

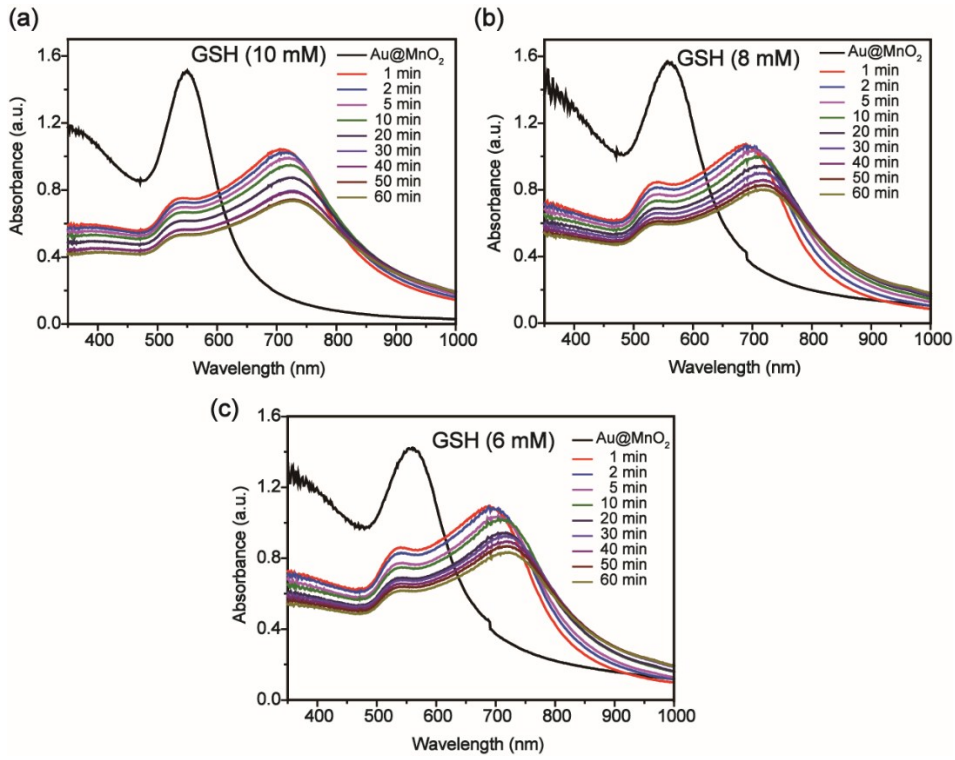

Figure S8. UV-Vis-NIR absorption spectra of Au@MnO_2 at different times after addition of (a) 6 mM, (b) 8 mM and (c) 10 mM GSH.

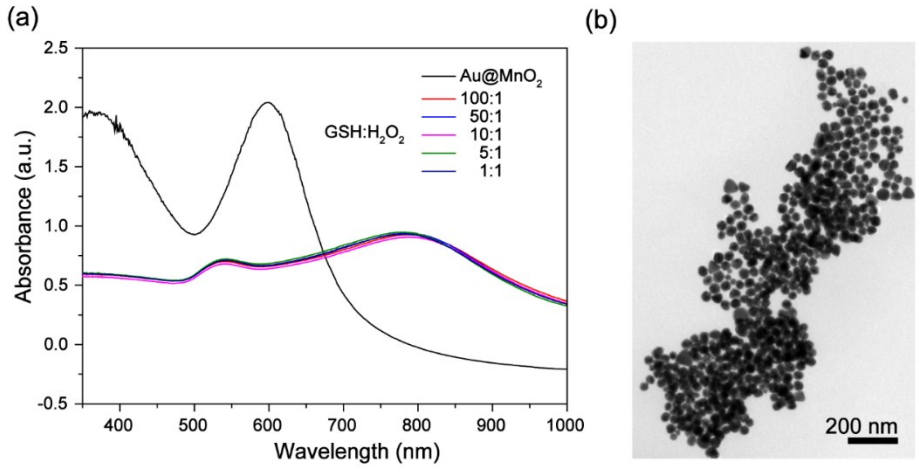

Figure S9 (a) Absorption spectra of Au@MnO_2 in the presence of GSH and H_2O_2 with different ratio (100:1, 50:1, 10:1, 5:1 and 1:1); (b) TEM image of the Au@MnO_2 in the presence of GSH and H_2O_2 with ratio of 1: 1.

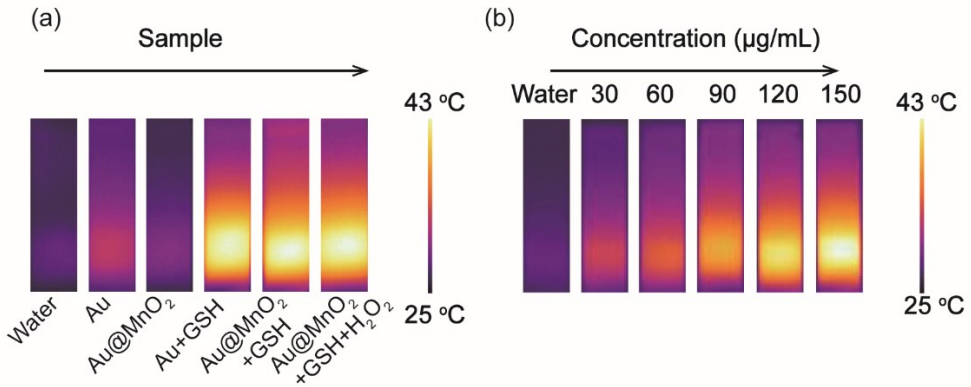

Figure S10. Thermal images of (a) water (control), gold (Au), gold@manganese dioxide (Au@MnO_2), Au+GSH, Au@MnO_2+GSH, Au@MnO_2+GSH +H_2O_2 and (b) an Au@MnO_2 aqueous dispersion with different concentrations (30, 60, 90, 120, and 150 μg/mL) in the presence of GSH after 15 min of 808 nm laser (1W/cm^2) irradiation. Here, the Au is a nanosphere and GSH concentration is 10 mM and H_2O_2 concentration is 1 mM.

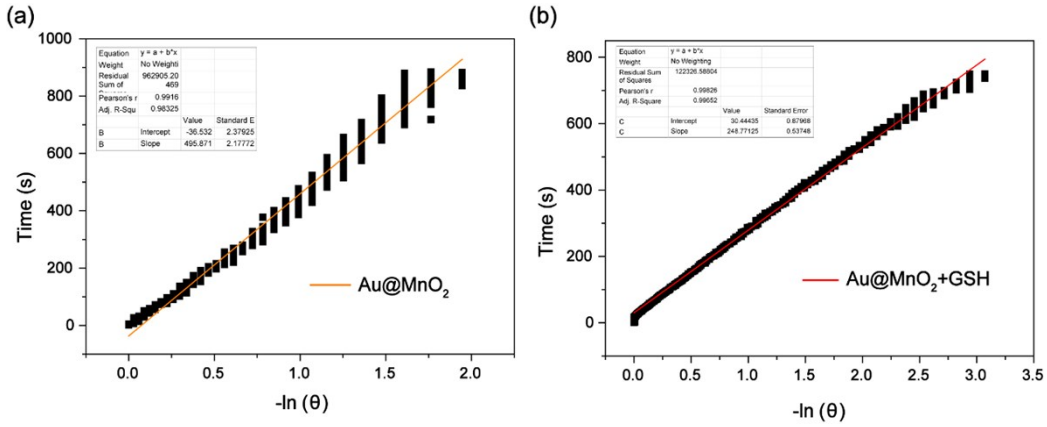

Figure S11. The time constant obtained for (a) gold@manganese dioxide (Au@MnO_2) and (b) Au@MnO_2 in the presence of glutathione (GSH).

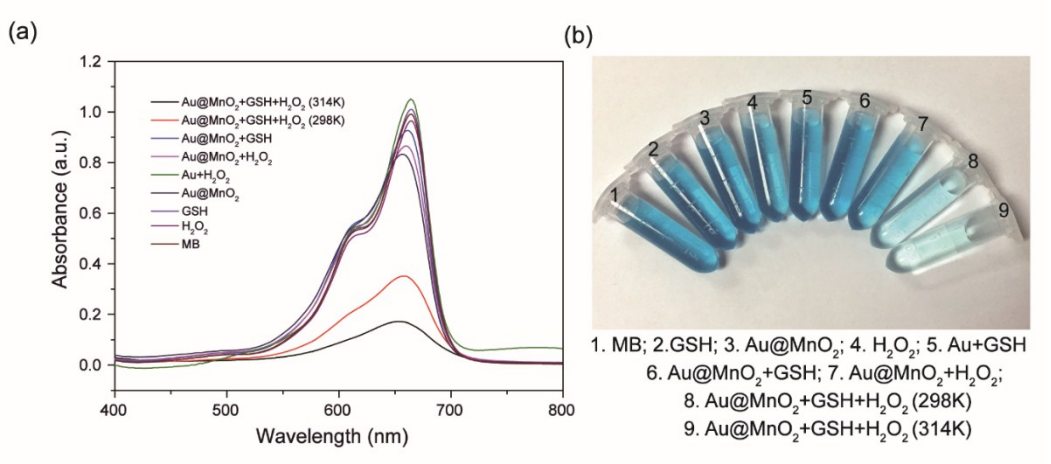

Figure S12. (a) The absorption and (b) corresponding photograph of the methylene blue (MB) solution after a 30 min incubation under different conditions.

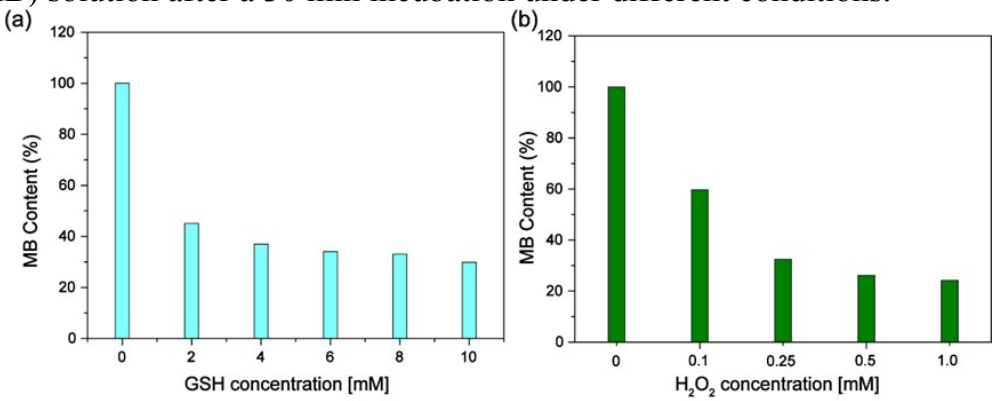

Figure S13. The methylene blue (MB) content after a 30 min incubation with (a) gold@manganese dioxide ($Au@MnO_2$) in the presence of 1 mM H_2O_2 with different glutathione (GSH) concentrations and (b) $Au@MnO_2$ in the presence of 10 mM GSH with different H_2O_2 concentrations.

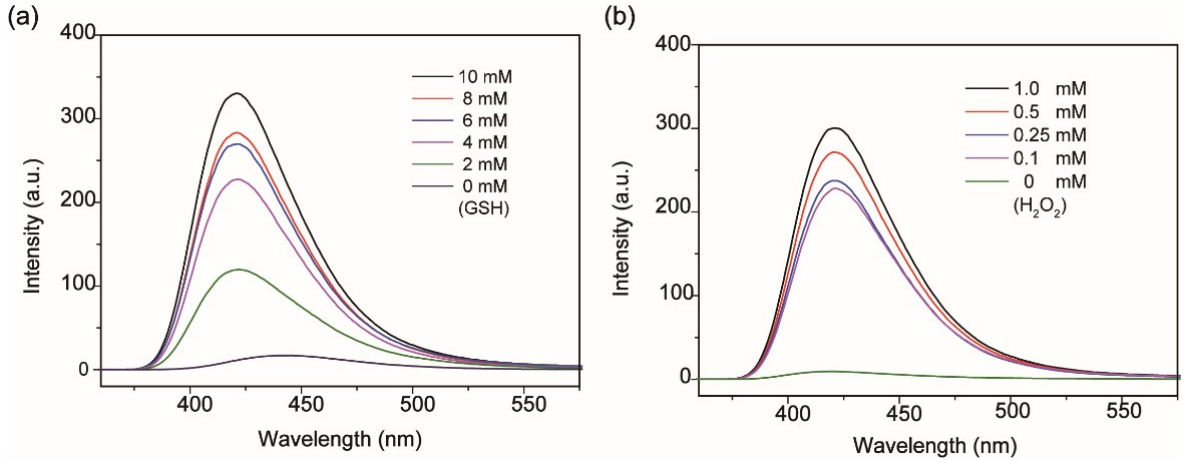

Figure S14. The fluorescence intensity of TPA solution mixed with different concentration of GSH or H_2O_2: (a) GSH concentration changed from 0 to 2, 4, 6, 8 and 10 mM and kept H_2O_2 (1.0 mM); (b) H_2O_2 concentration changed from 0 to 0.125, 0.25, 0.5, 0.75 and 1.0 mM and kept GSH (10 mM).

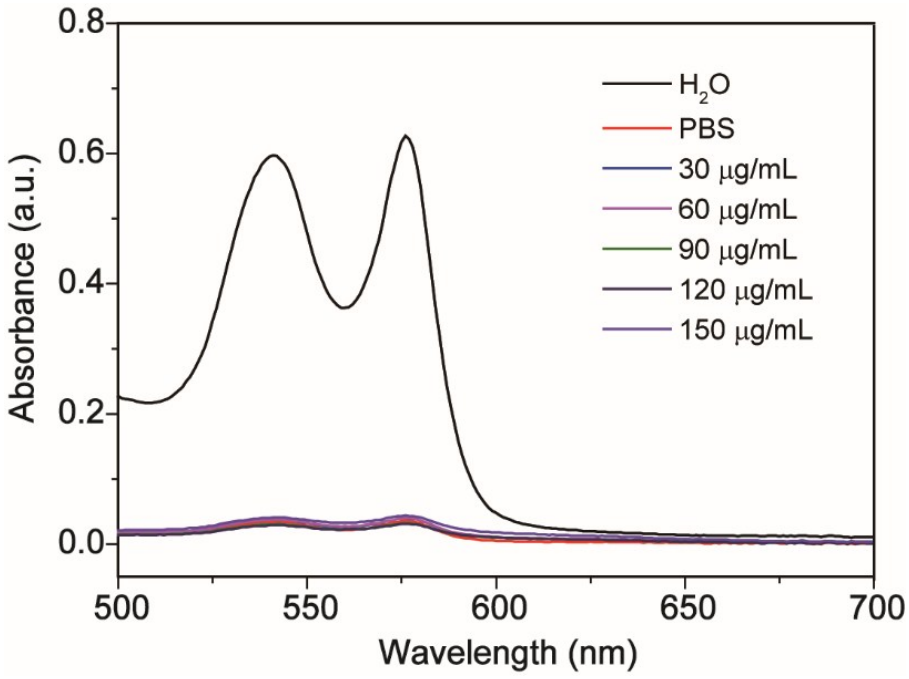

Figure S15. The absorption of the red blood cells (RBCs) supernate after being treated by different concentrations of Au@MnO_2, PBS and water.

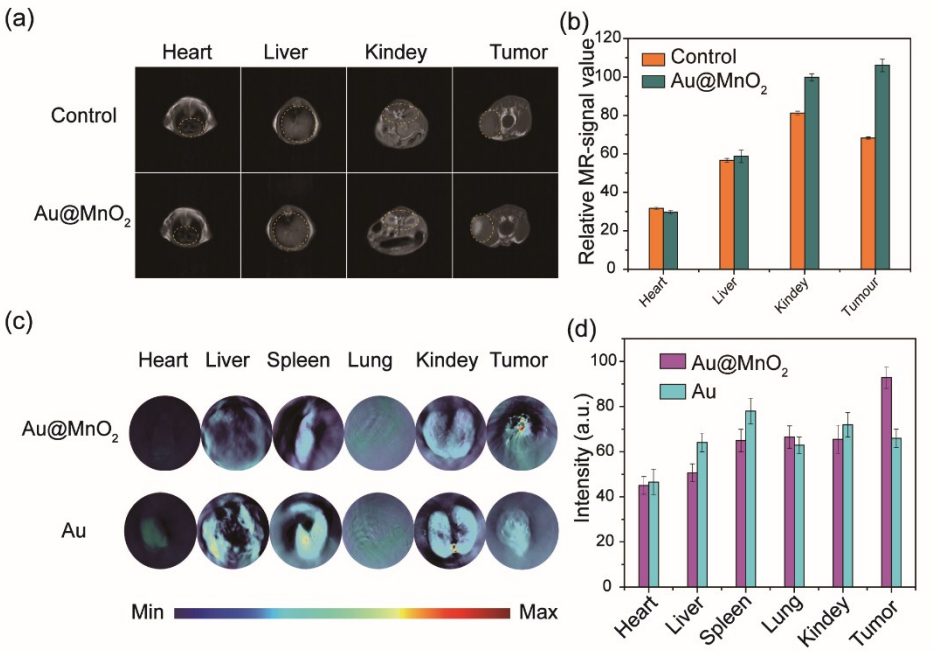

Figure S16 (a) MR imaging and (b) corresponding MR signal of normal organs and tumors in mice without (control) and with intravenous injection of Au@MnO_2 nanoparticles after 8 h; (c) Photoacoustic imaging and (d) corresponding photoacoustic signal values of normal tissue and tumors after intravenous injection of A@MnO_2 and Au nanoparticles for 8 h.

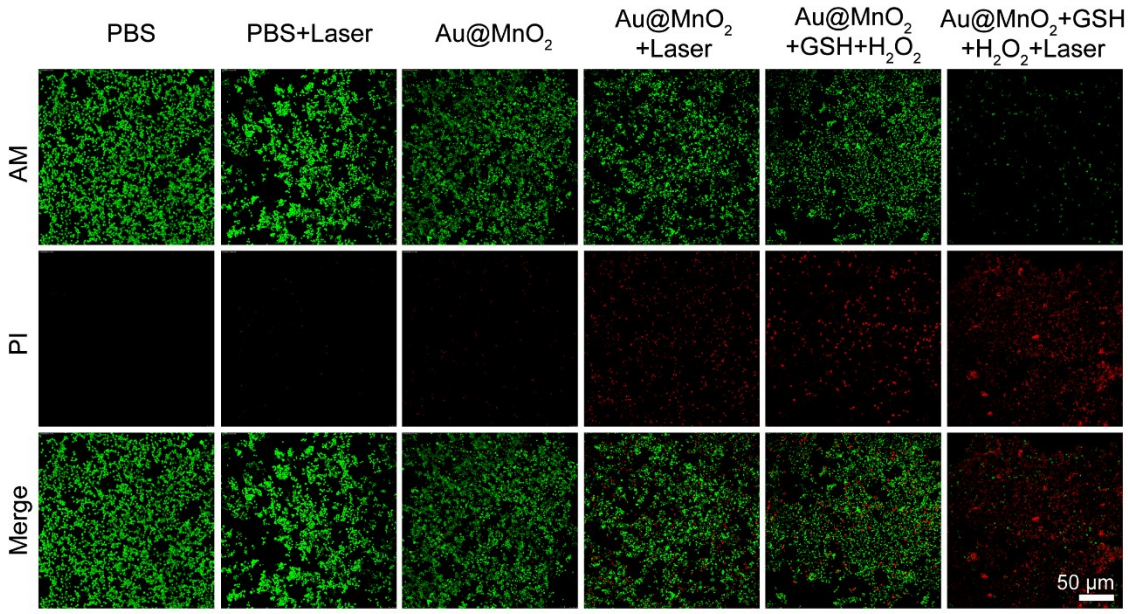

Figure S17. Confocal laser scanning microscopy images of the cell treated by different condition, which the live and dead cells are dyed by calcein-AM (green fluorescence) and propidium iodide (PI, red fluorescence) respectively. The incubation concentration of the Au@MnO_2, GSH, H_2O_2 are 75 ug/mL, 1 mM and 0.1 mM respectively. The laser is 808 nm with the density of 1 W/cm^2 and the irradiation time is 10 mins.

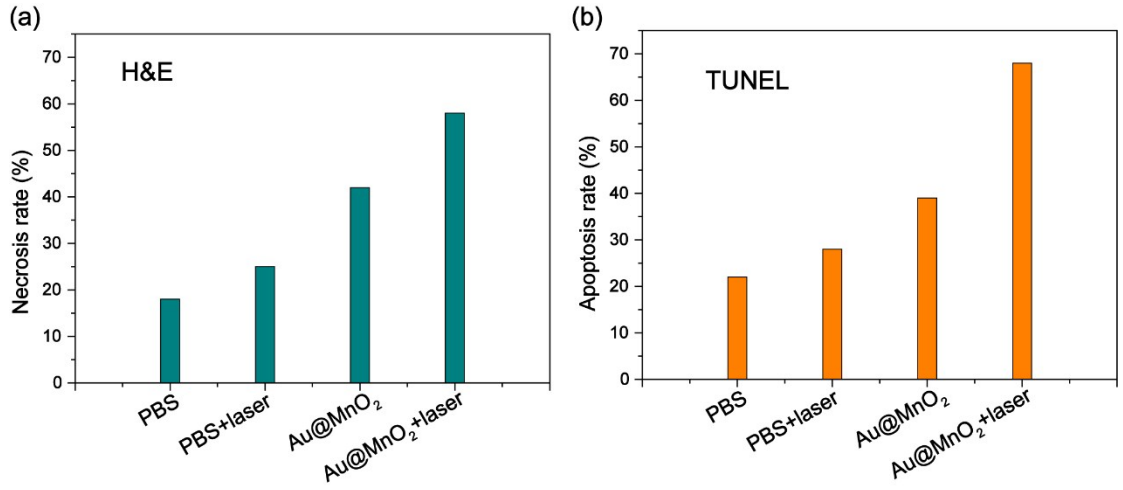

Figure S18. (a) The necrosis rate and (b) apoptosis rate obtained from tumor sections stained by hematoxylin and eosin (H&E) and terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL), respectively.

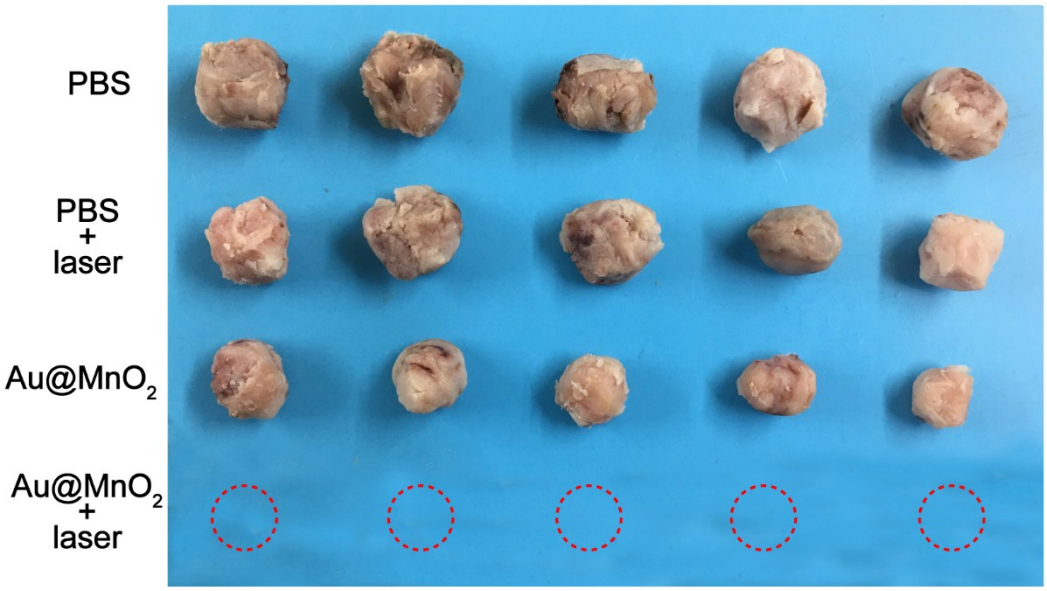

Figure S19. Photograph of the tumors taken from the mouse for each group after 16 days treatment.