

Supplementary Materials

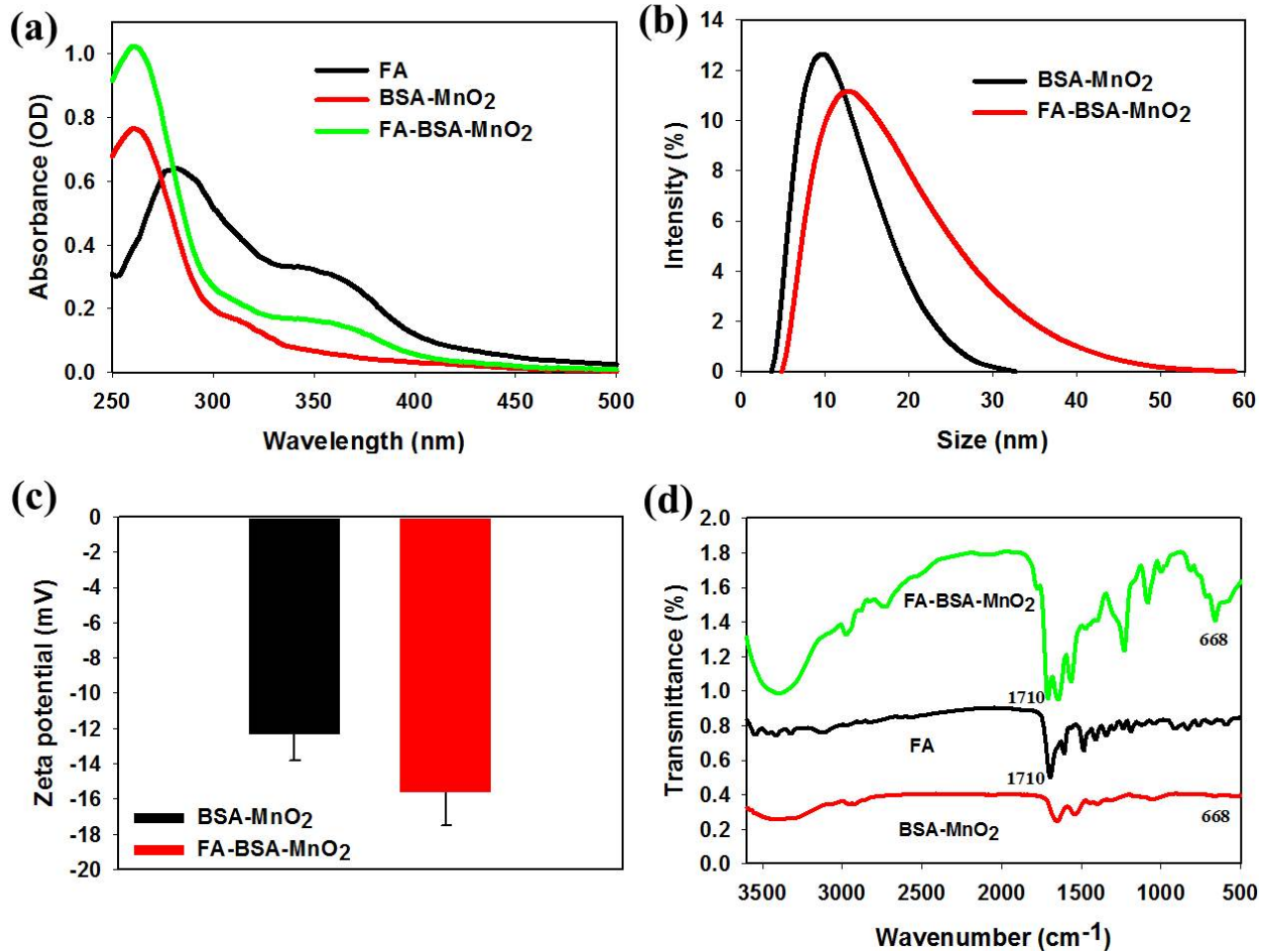


Figure S1 The UV- Visible spectroscopy (a), particle size distribution (b), zeta potential (c), and Fourier transform infrared (FTIR) spectroscopy (d) analysis of BSA-MnO₂ and FA-BSA-MnO₂. The values are reported as mean \pm SD from three experiments (n = 3).

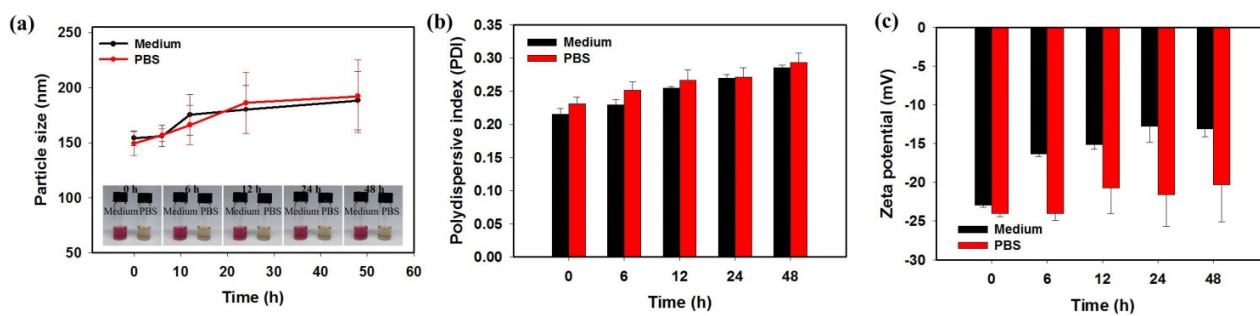


Figure S2 The suspension stability of rGOQD/MnO₂/CpG/Q/FA in PBS and cell culture medium (90% DMEM + 10% FBS) form changes in average particle size/gross observation (a), polydispersity index (b), and zeta potential (c). The values are reported as mean ± SD from three experiments (n = 3).

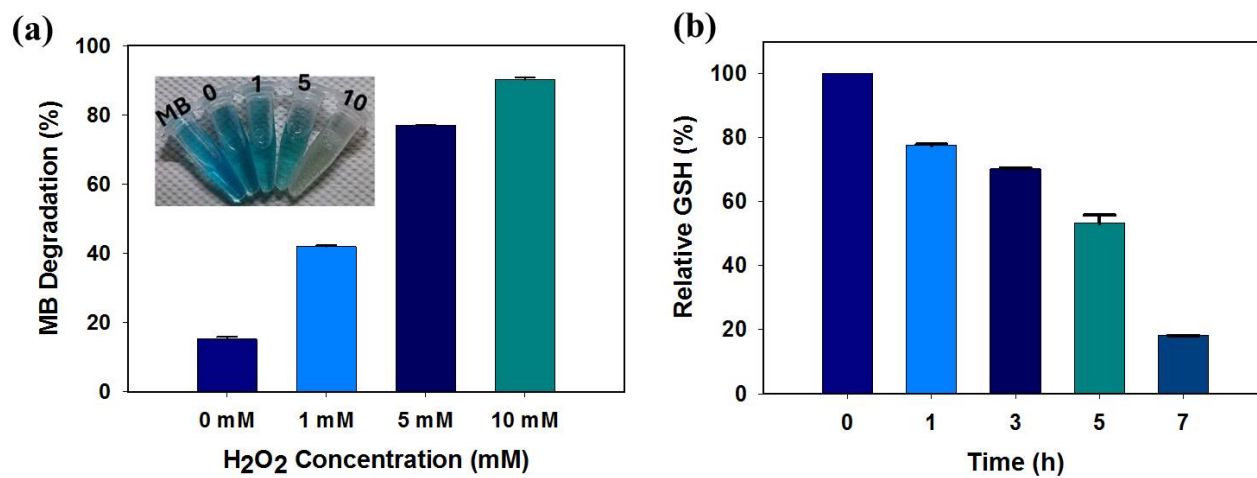


Figure S3 Detection of hydroxyl radical ($\cdot\text{OH}$) generation via methylene blue (MB) degradation in the presence of hydrogen peroxide (a), and assessment of GSH scavenging using DTNB as a colorimetric probe (b). The values are reported as mean \pm SD from five experiments ($n = 5$).

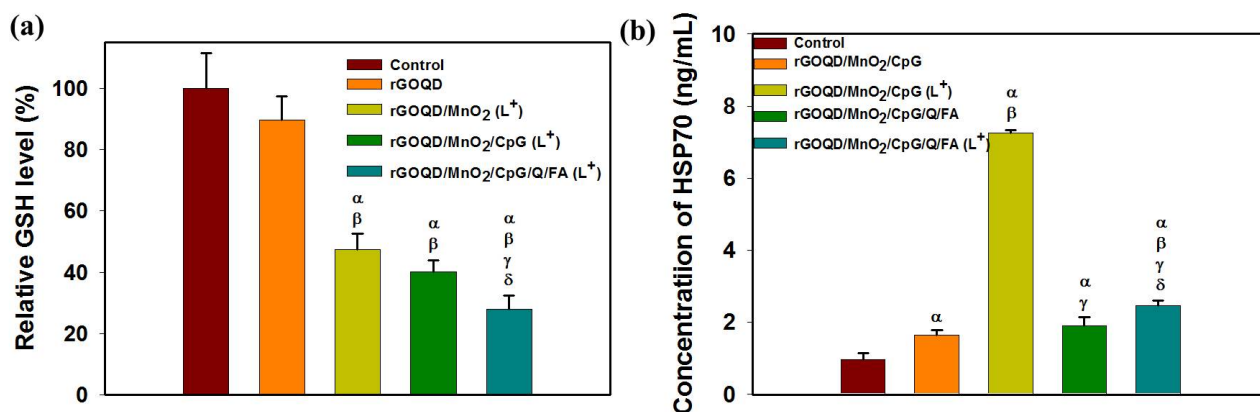


Figure S4. Intracellular GSH measurement utilizing DTNB as a fluorescent probe (a) and quantification of intracellular HSP70 expression levels (b) after treating B16F10 cells with PBS (control) and different nanoparticles. The values are reported as mean \pm SD from five experiments ($n = 5$). The L⁺ group is with NIR laser irradiation. $^{\alpha}p < 0.05$ compared with control, $^{\beta}p < 0.05$ compared with rGOQD/MnO₂/CpG, $^{\gamma}p < 0.05$ compared with rGOQD/MnO₂/CpG (L⁺), and $^{\delta}p < 0.05$ compared with rGOQD/MnO₂/CpG/Q/FA.

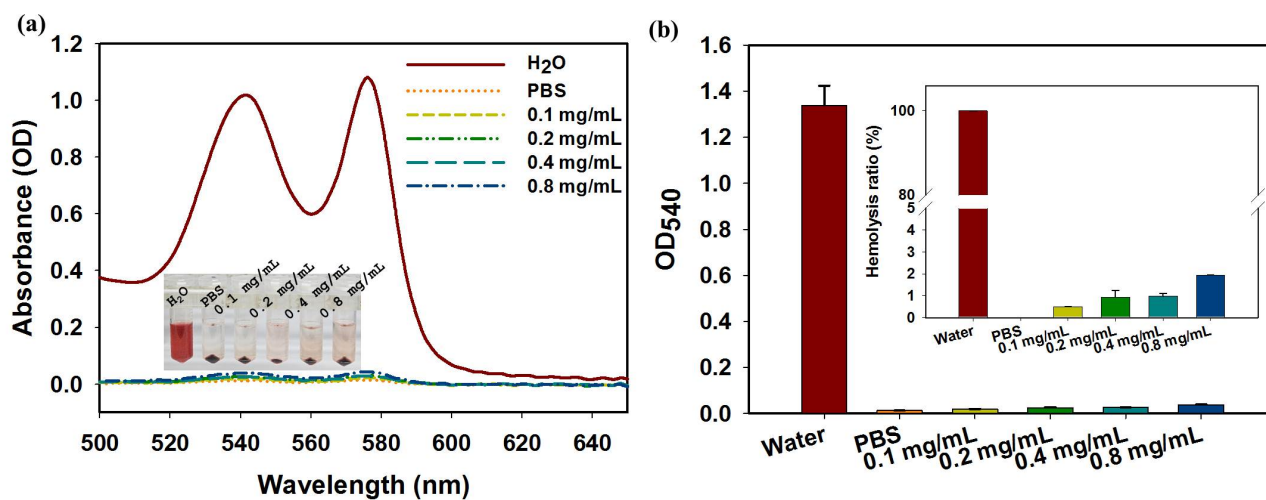


Figure S5 Hemocompatibility evaluation from UV–Vis absorbance spectra of released hemoglobin by incubating red blood cells with different concentrations of rGOQD/MnO₂/CpG/Q/FA (a), and hemolysis ratio (%) calculated from the absorbance at 540 nm (OD₅₄₀) (b). The values are reported as mean ± SD from three experiments (n = 3). Water is the positive control, and PBS is the negative control.

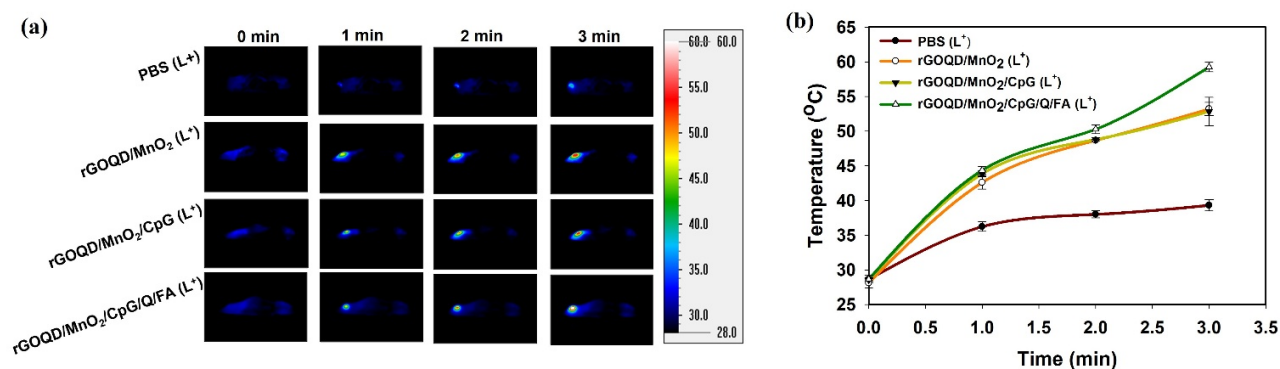


Figure S6. Representative real-time infrared thermal images of B16F10 tumor-bearing mice treated with PBS (L⁺), rGOQD/MnO₂ (L⁺), rGOQD/MnO₂/CpG (L⁺), and rGOQD/MnO₂/CpG/Q/FA (L⁺) (a), and the corresponding time-lapsed temperature variation curves (b). The values are reported as mean \pm SD from three experiments (n = 3).

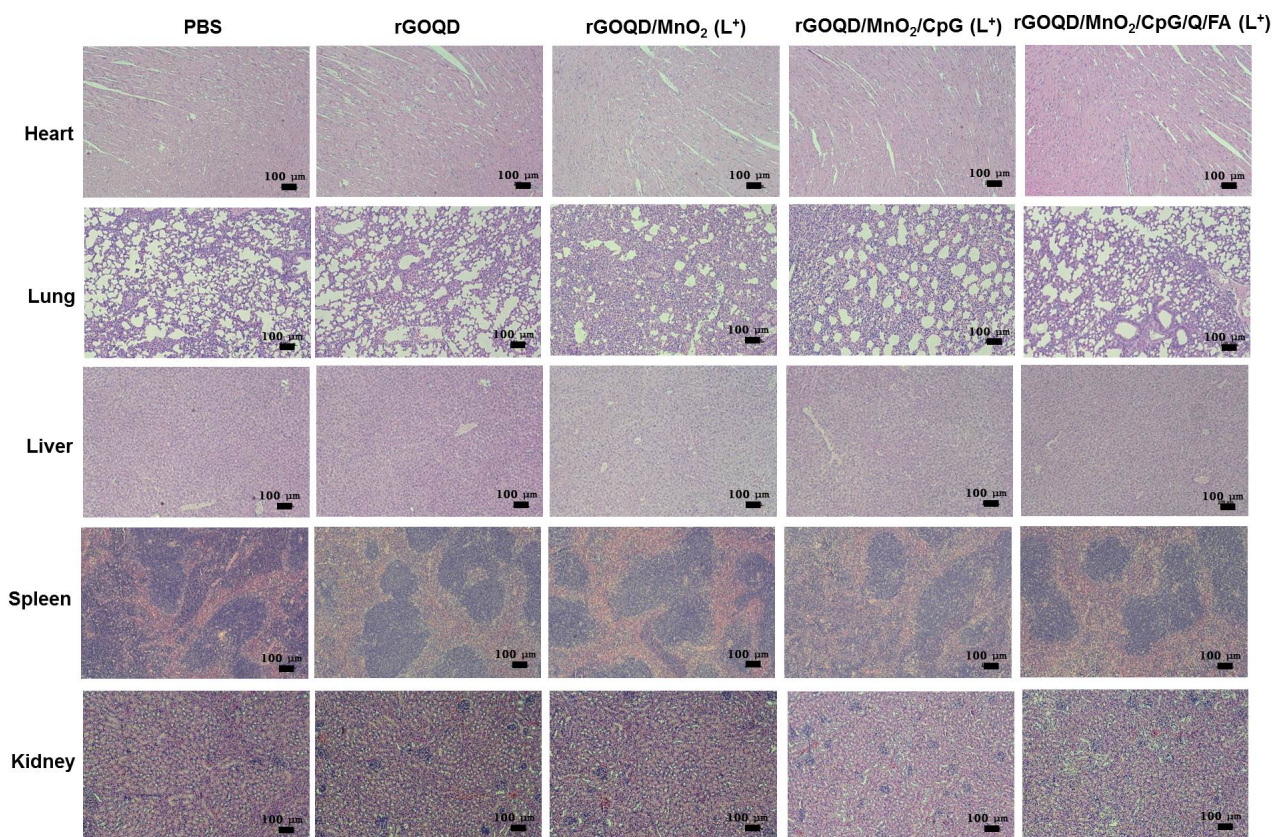


Figure S7. H&E stain images of the major organs (heart, lung, liver, spleen, and kidney) excised from sacrificed mice after different treatments (bar = 100 μm). The L⁺ group is with NIR laser irradiation.

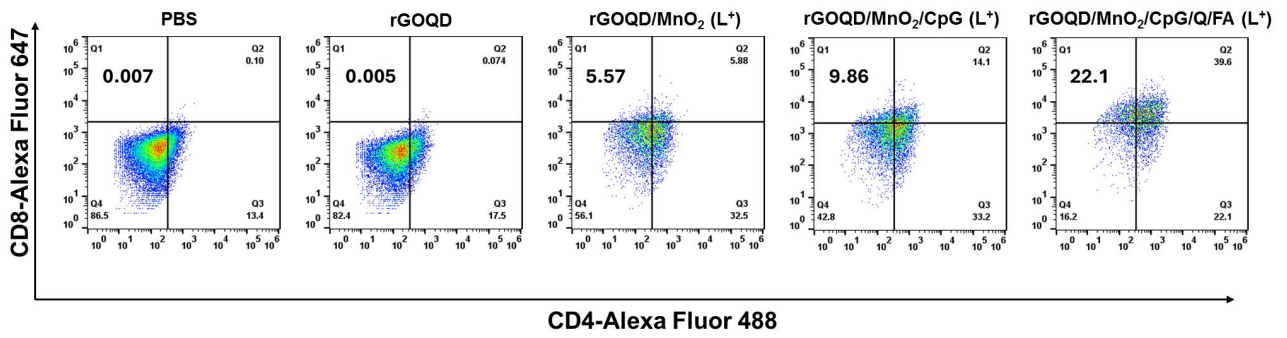


Figure S8 Flow cytometry analysis of CD4⁺ and CD8⁺ T cells in tumor tissues. The L⁺ group is with NIR laser irradiation.