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Supporting Information

PEGylated Reduced-Graphene Oxide Hybridized with Fe_3O_4 Nanoparticles for Cancer Photothermal-Immunotherapy

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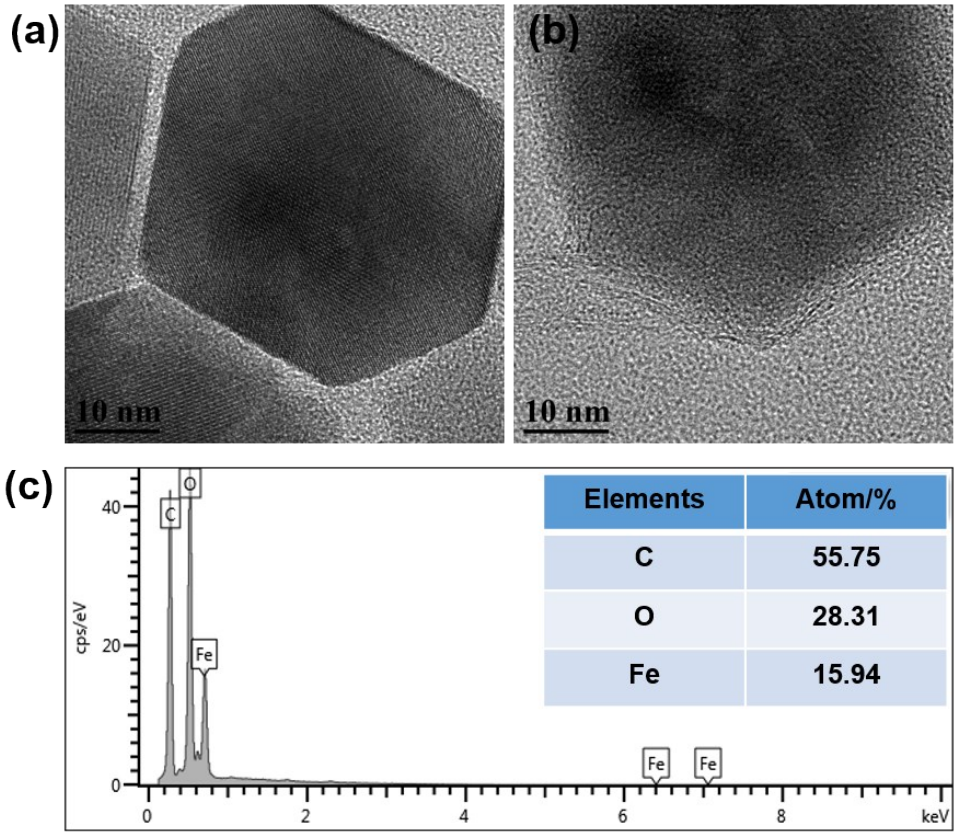

Fig. S1. Morphology and composition characterization of FNPs/rGO-PEG. High Resolution Transmission Electron Microscope (HRTEM) images of (a) FNPs and (b) FNPs/rGO-PEG. Scale bar = 10 nm. (c) Energy dispersive X-ray spectrum (EDS) analysis of FNPs/rGO-PEG, which reveals the existence of Fe, O and C elements in FNPs/rGO-PEG.

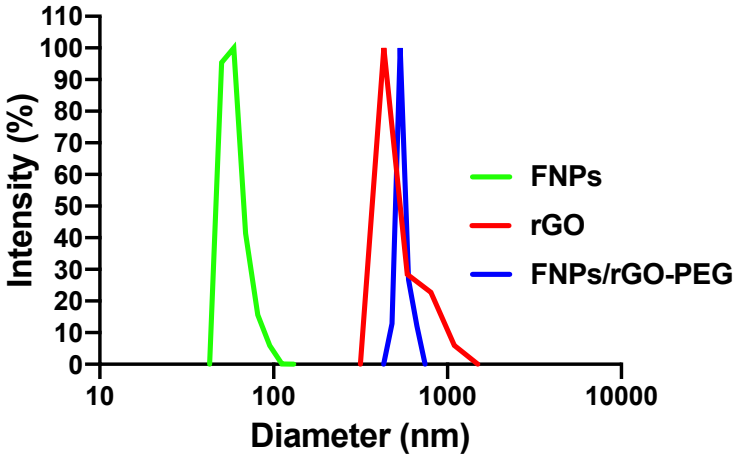

Fig. S2. Hydrodynamic diameter distribution of the FNPs, rGO-PEG and FNPs/rGO-PEG. The hydrodynamic diameter of the FNPs (58.96 nm) is in agreement with their TEM images. The hydrodynamic diameter of FNPs/rGO-PEG increased to 534.87 nm, which similar with the hydrodynamic diameter of rGO, indicated that the FNPs were successfully encapsulated in rGO-PEG.

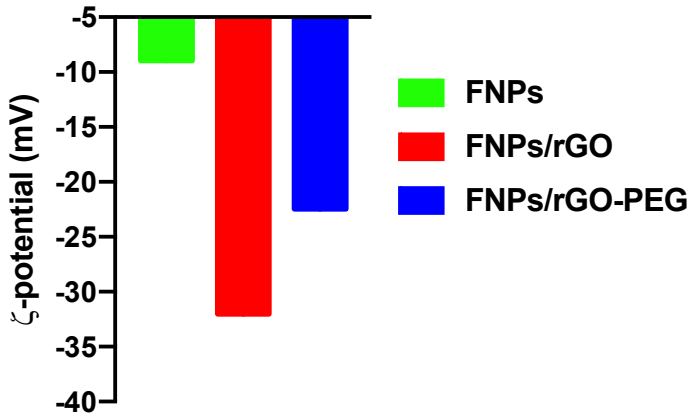

Fig. S3. Zeta-potentials of FNPs, FNPs/rGO and FNPs/rGO-PEG obtained from the DLS measurement. After the encapsulation of the rGO, the zeta-potential of the FNPs changed from -8.96 mV to -32.028 mV (pH 7.4), which verifying the successful conjugation of rGO to the surface of FNPs.

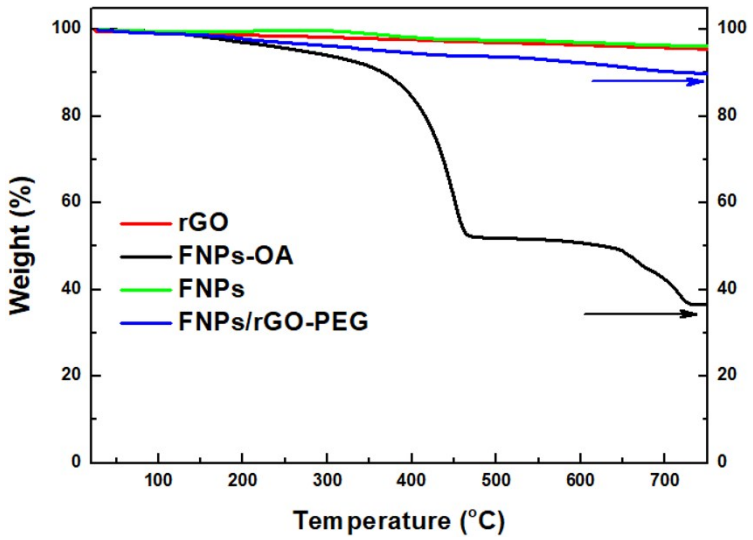

Fig. S4. The oleate-capped FNPs display a large weight loss of 62.83% with a decomposition temperature of 794 ^{o}C. For comparison, the FNPs show a much smaller weight loss of 3.78%, thus re-confirming the successful removal of oleate ligand from the surface of the FNPs. In comparison with FNPs and rGO, the FNPs/rGO-PEG show a much larger weight loss of 10.47%, thus re-confirming the successful modification of the PEG-NH_2 on the surface of FNPs/rGO.

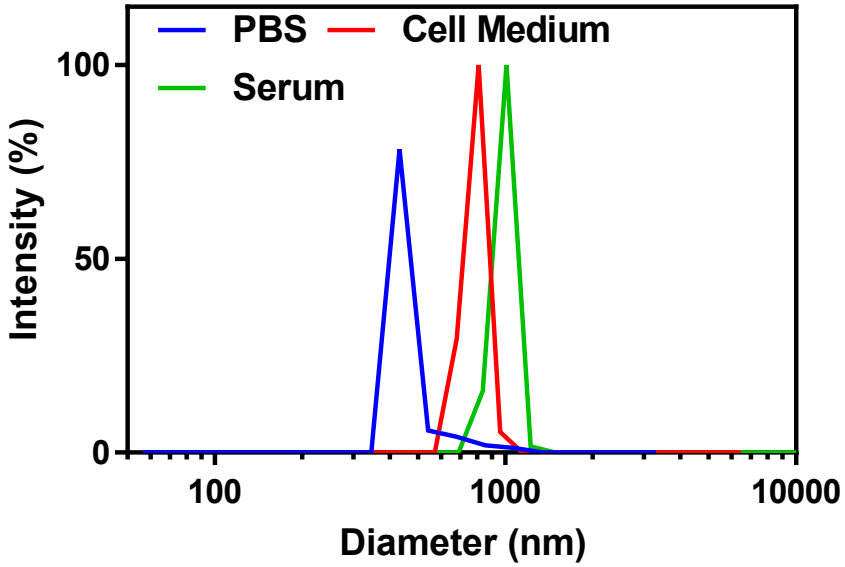

Fig. S5. Hydrodynamic diameter distribution of FNPs/rGO-PEG in PBS, Cell Medium and Serum.

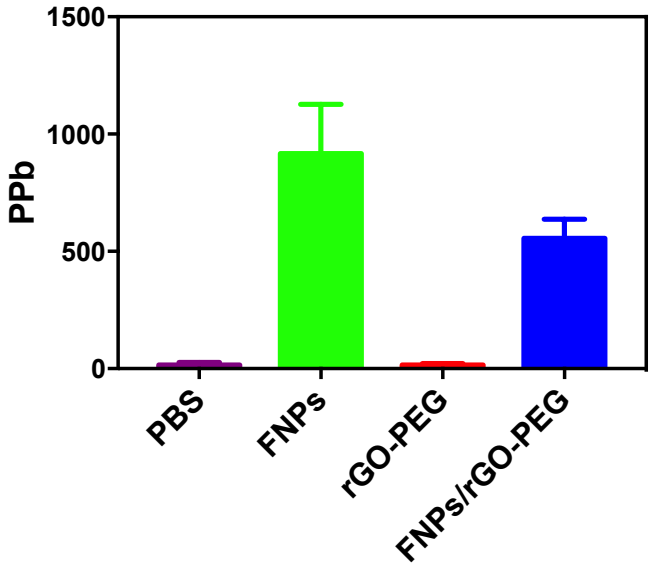

Fig. S6. Fe contents in 4T1 tumor cells after treatment with PBS, FNPs, rGO-PEG and FNPs/rGO-PEG. (n = 4). 4T1 tumor cells were incubated with PBS, FNPs (500 μg mL^{-1}), rGO-PEG (40 μg mL^{-1}) and FNPs/rGO-PEG (500 μg mL^{-1}) for 4 h. After 4 h incubation, the cells were collected and washed twice with PBS. Then the different cell samples were analyzed via Inductive Coupled Plasma Emission Spectrometer (ICP). Data are presented as the mean ± S.E.M.

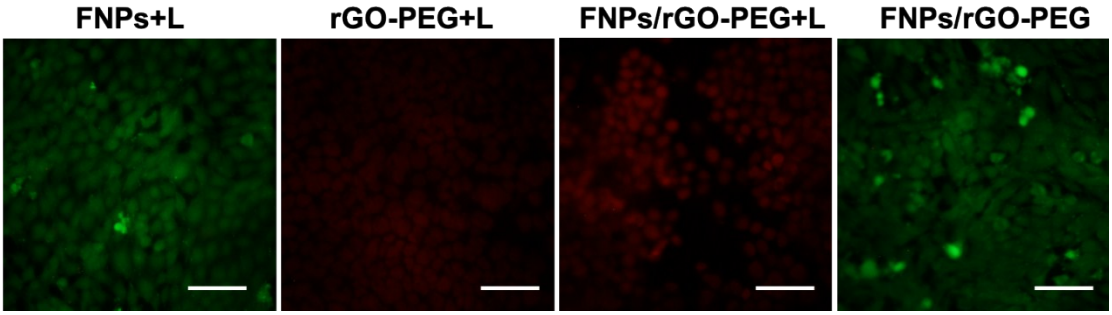

Fig. S7. Fluorescence images of 4T1 tumor cells incubated with FNPs, rGO-PEG and FNPs/rGO-PEG after irradiation by the 805-nm laser (1 W cm^{-2}) for 5 min. The cells were co-stained by calcein AM (green, live cells) and propidium iodide (red, dead cells) before imaging. Scale bar = 100 μm.

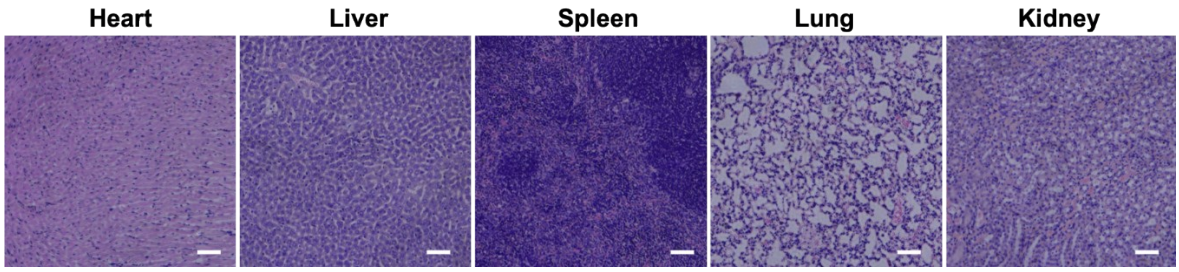

Fig. S8. Representative H&E-stained images of major organs from the FNPs/rGO-PEG treated mice. Scale bar = 100 μm.

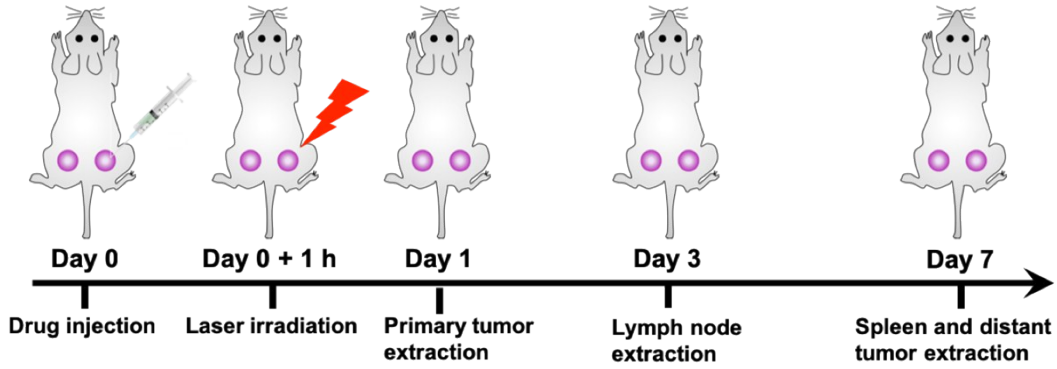

Fig. S9. Schematic depiction of tumor-specific abscopal effect.

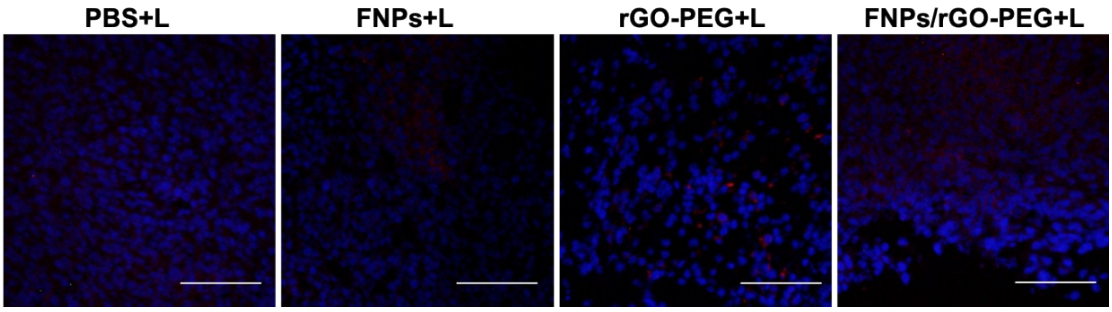

Fig. S10. Histochemical images of tumor cells collected 24 h after different treatments. Immunofluorescence of the tumors showed infiltrated $CD11c^+$ DC cells. Scar bar = 200 μm.

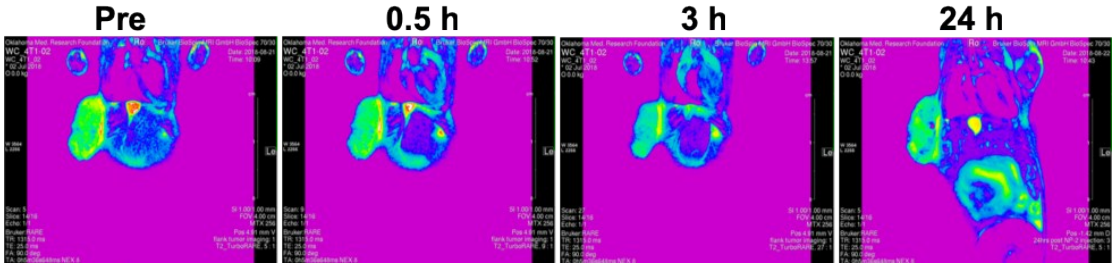

Fig. S11. *In vivo* MR images of a tumor-bearing mouse before and after intravenous injection of FNPs/rGO-PEG at different time frames (0, 0.5 h, 3 h and 24 h).

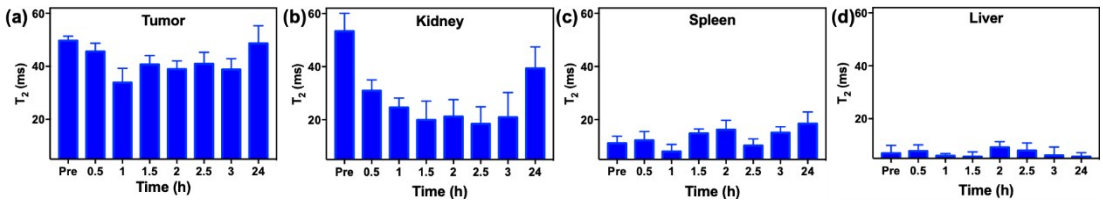

Fig. S12. Corresponding representative T2*-weighted signals of tumor (a), kidney (b), spleen (c) and liver (d) at different time points after intravenous injection of FNPs/rGO-PEG.