Supplementary Information

Photothermally Triggered Melting and Perfusion: Responsive Colloidosomes for Cytosolic Delivery of Membrane-Impermeable Drugs in Tumor Therapy

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1. Calculation of the Photothermal Conversion Efficiency

The photothermal conversion efficiency (η) of MAPC was determined according to the following equation used in the reported studies.[1, 2]

$$\eta = \frac{hS(T_{max} - T_{Surr}) - Q_0}{I(1 - 10^{-A_{808}})} \quad (1)$$

Where h represents the heat transfer coefficient, S represents the sample container surface area, T_{max} represents the steady-state maximum temperature of suspensions of MAPC under laser irradiation, T_{surr} represents the ambient room temperature, Q_0 represents the background energy input by the solvent, and the sample container without the presence of MAPC, I represents incident energy of laser power, and A_{808} represents the absorbance of suspensions (100 μg mL^{-1}) at 808 nm.

The value of hS was calculated according to the following equation:

$$\tau_s = \frac{m_d c_d}{hS} \quad (2)$$

Where τ_s is the characteristic thermal time, m_d and c_d represent the mass and heat capacity of solvent (water in here). The m_d is 1.0 g, and the c_d is 4.187 J g^{-1} K^{-1}. To obtain the τ_s, a dimensionless driving force temperature (θ) was introduced using the maximum system temperature and was presented as follows,

$$\theta = \frac{T - T_{surr}}{T_{max} - T_{surr}} \quad (3)$$

At the cooling period, τ_s could be calculated according to the following expression, where t is the time (in s):

$$t = -\tau_s ln\theta \quad (4)$$

The heat energy (Q_0) of the sample cell and solvent without NPs was calculated from an independent experiment using the following equation:

$$Q_0 = hS(T_{max,water} - T_{Surr}) \quad (5)$$

Therefore, the photothermal conversion efficiency (η) of MAPC was calculated to be 43.3%.

2. Supporting Figures.

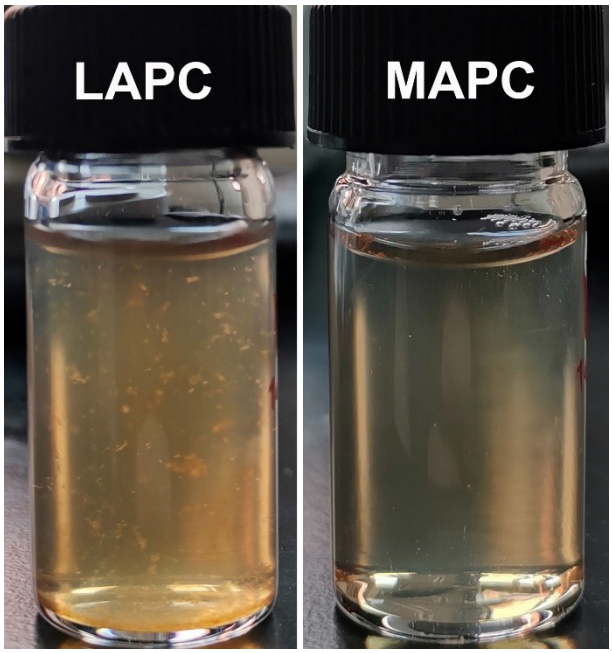

Fig. S1. Digital photographs of aqueous suspensions of freshly synthesized LAPC after stored at room temperature for 24 h.

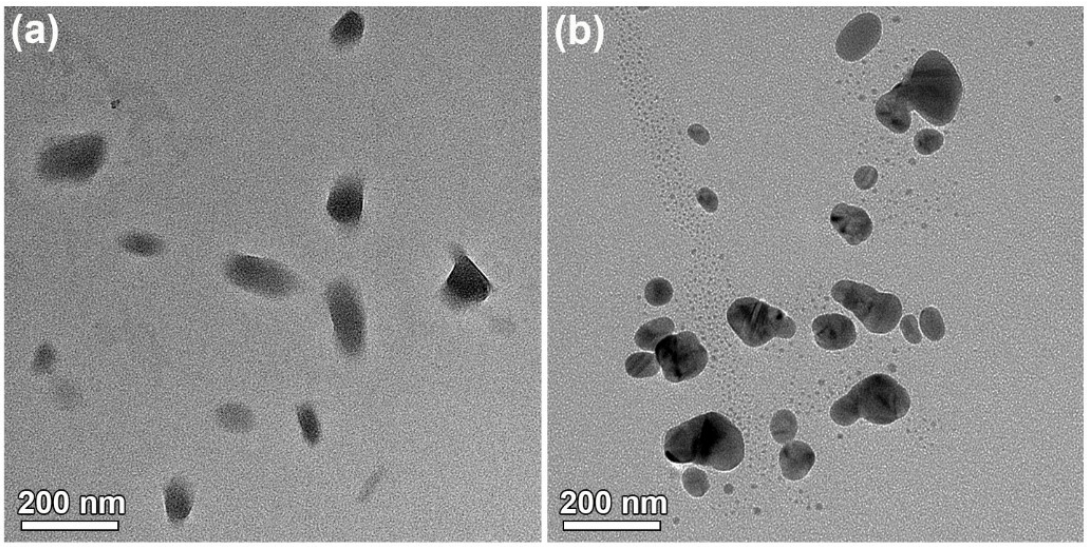

Fig. S2. TEM images of solid lipid nanoparticles (SLNs) comprising myristic acid and Tween® 20 (a) and as-prepared SLNs after reacted with $AgNO_3$ for 6 h (b).

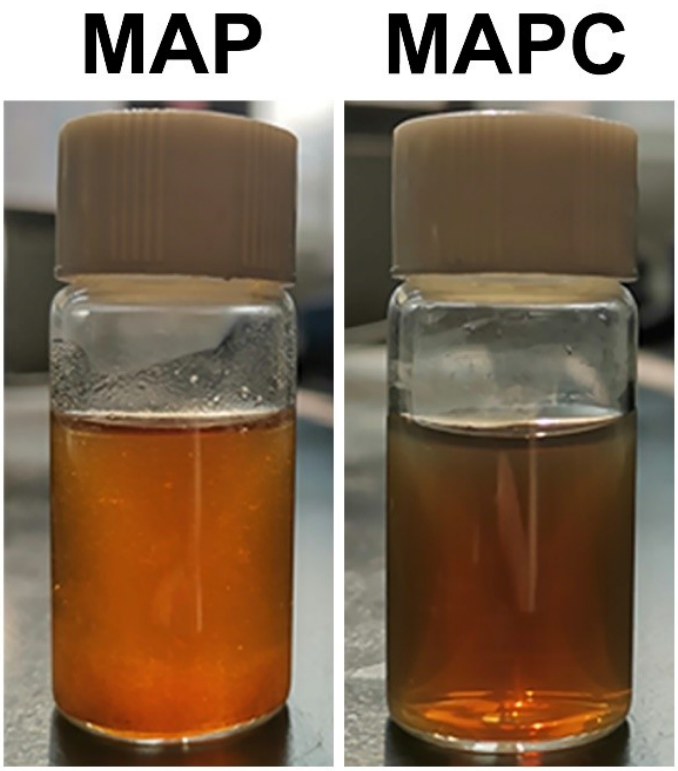

Fig. S3. Digital photographs of aqueous suspensions of freshly synthesized MAP and MAPC.

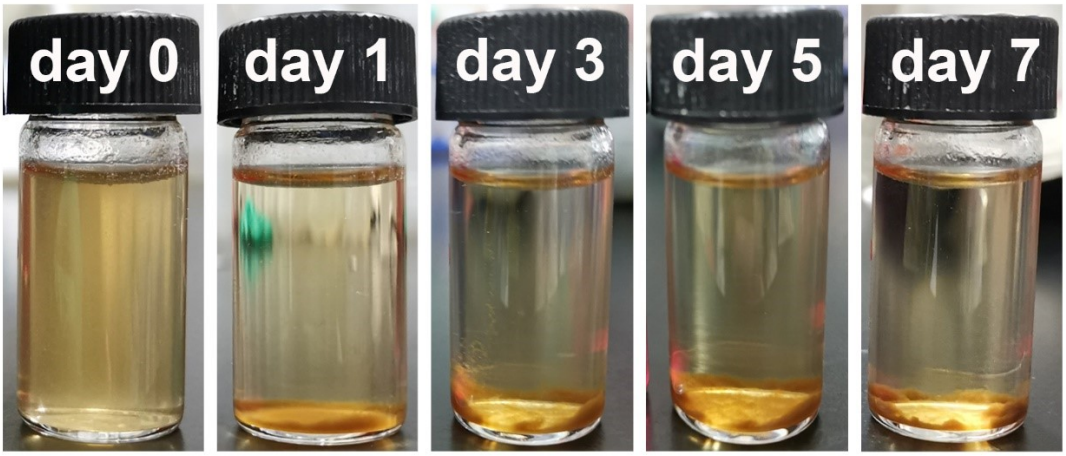

Fig. S4. Digital photographs of MAP in PBS over time.

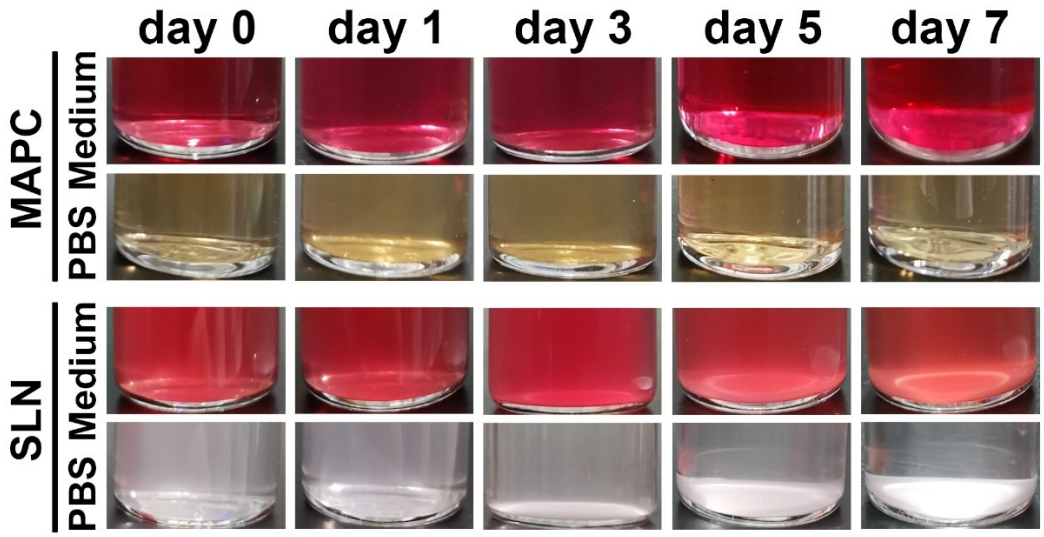

Fig. S5. Stability study of SAHA-loaded MAPCs and solid lipid NPs synthesized with myristic acid in a cell culture medium supplemented with 10% fetal bovine serum or PBS over time by recording the digital photographs. The white precipitates of SLNs observed in the bottom of the bottle suggesting the particulate aggregation of SLNs.

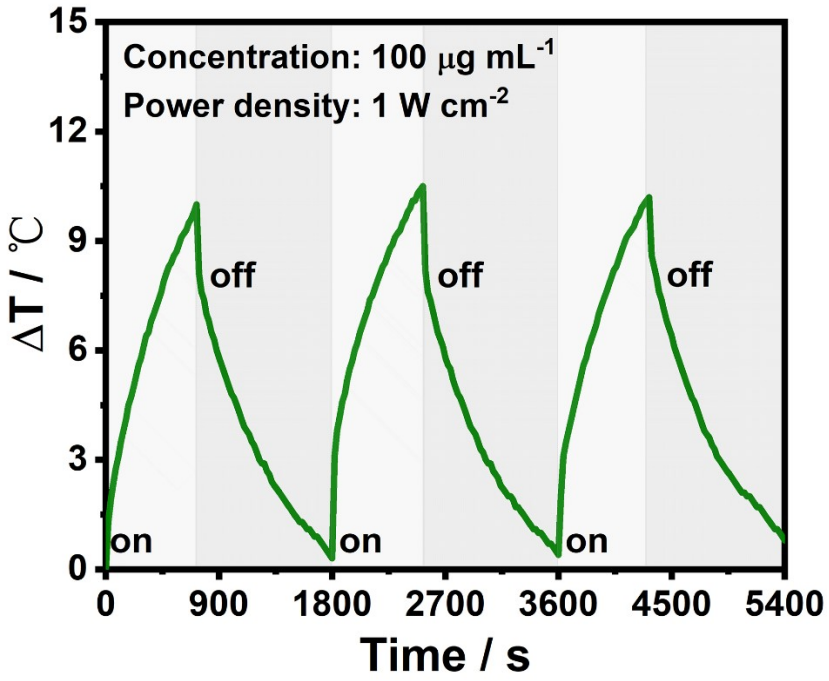

Fig. S6. Photostability test of SAHA-MAPC suspensions (100 μg mL^{-1}) over on/off cycles of laser irradiation (808 nm, 1 W cm^{-2}).

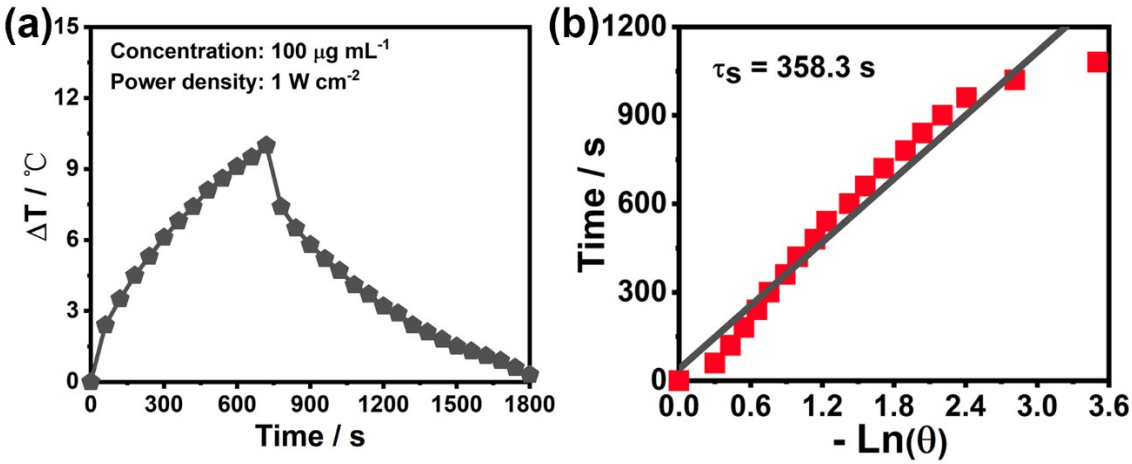

Fig. S7. Photothermal effect of an aqueous dispersion of SAHA-MAPC (100 μg mL^{-1}) under the irradiation of a NIR laser (1 W cm^{-2}), which was turned off after 12 min (a). Time constant (b) for heat transfer from the system was determined to be 358.3 s by applying the linear time data from the cooling period (after 12 min) versus the negative natural logarithm of driving force temperature (θ), which was obtained from the cooling stage of Figure (a).

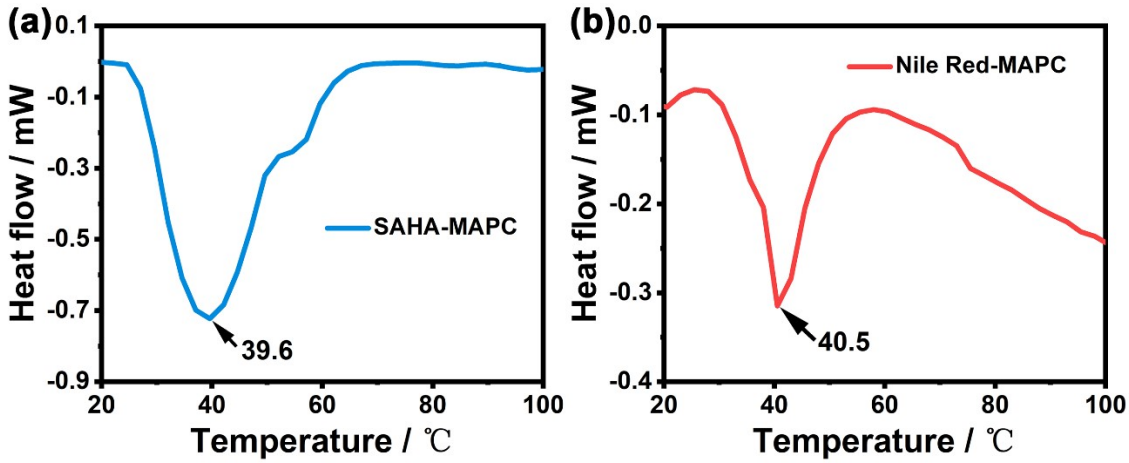

Fig. S8. Differential scanning calorimetry curves of SAHA-MAPC and Nile Red-MAPC, the melting point was determined to be 39.6°C and 40.5°C.

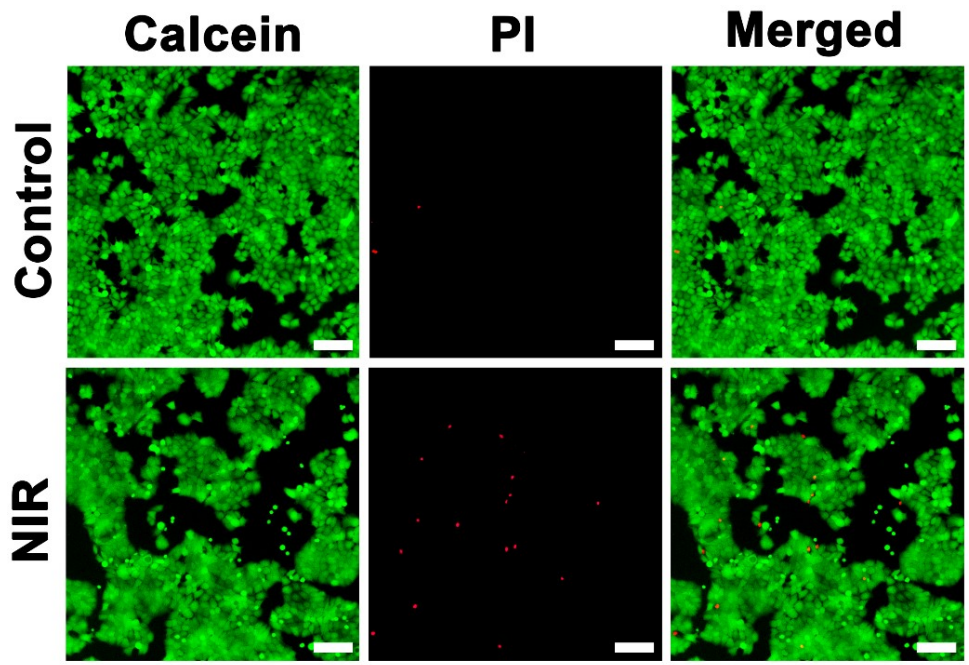

Fig. S9 Fluorescent images of viable and dead cell distributions after different treatments as indicated. Scale bar represents 200 μm.

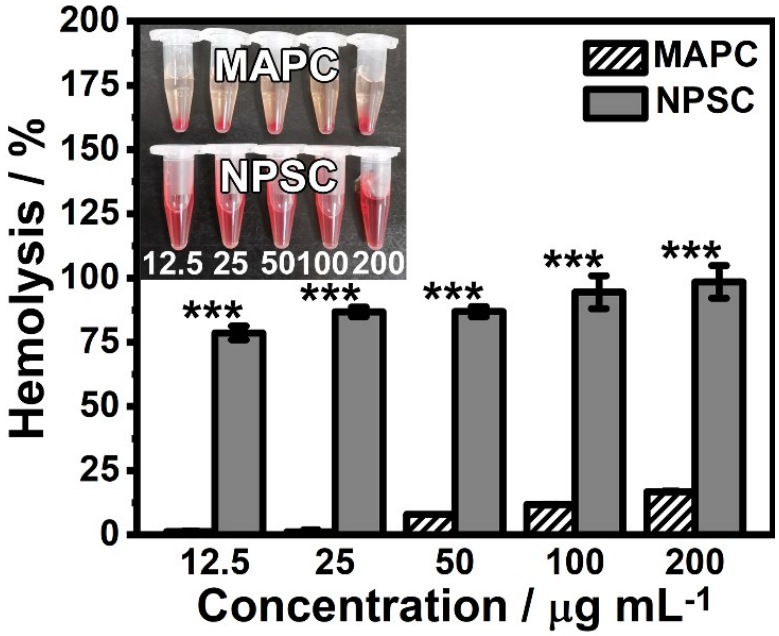

Fig. S10. Hemolysis percentage of red blood cells (RBCs) after incubated with MAPC or NPSC suspensions for 12 h. Inset: photographs of RBCs after treatments. ***$p < 0.001$.

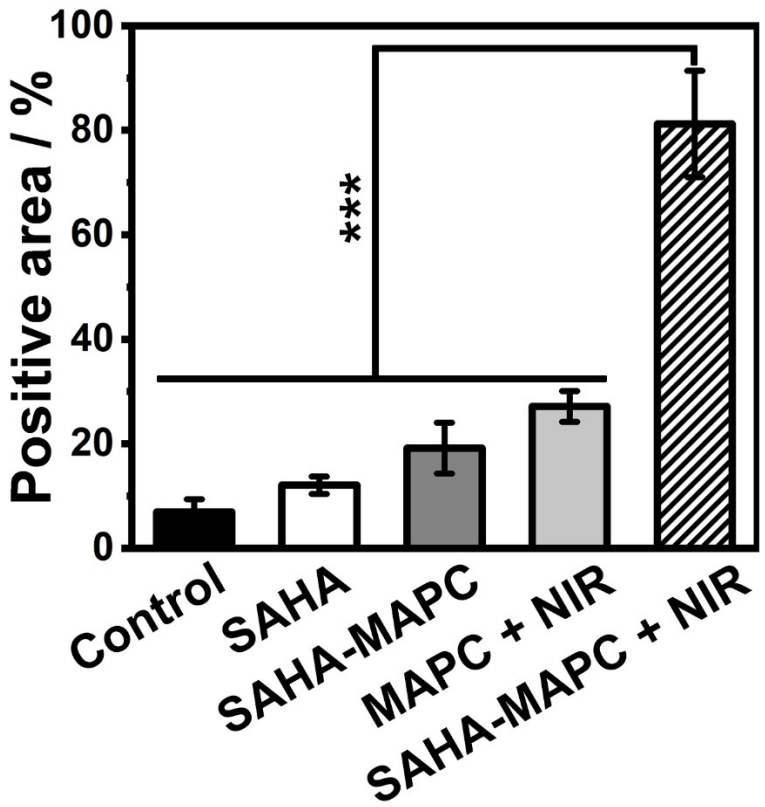

Fig. S11. Semiquantitative data of the dissected tumor tissues stained with TUNEL assay.

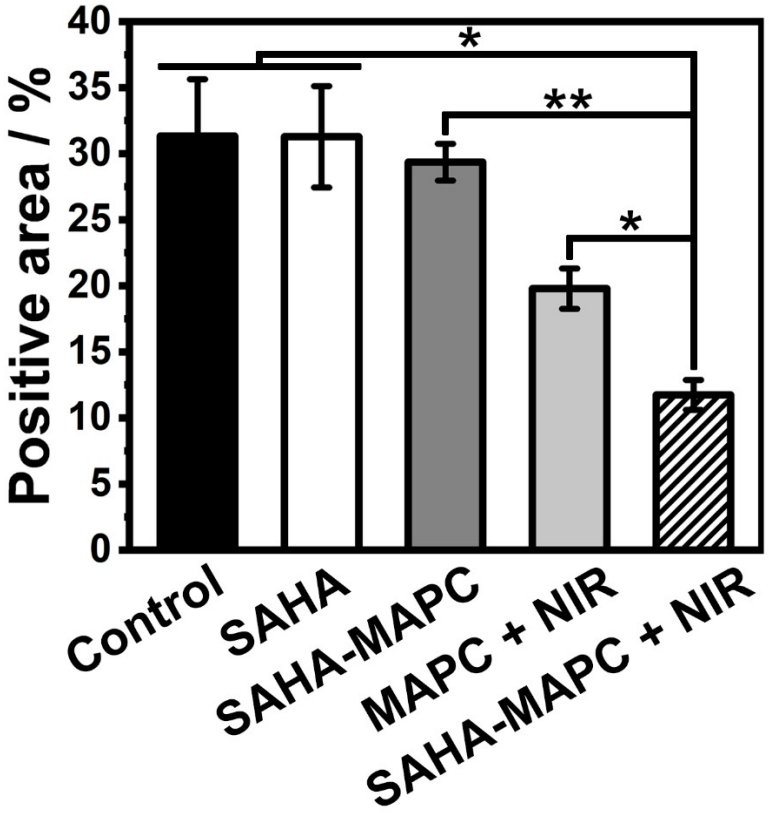

Fig. S12. Semiquantitative data of the dissected tumor tissues stained with Ki 67 assay.

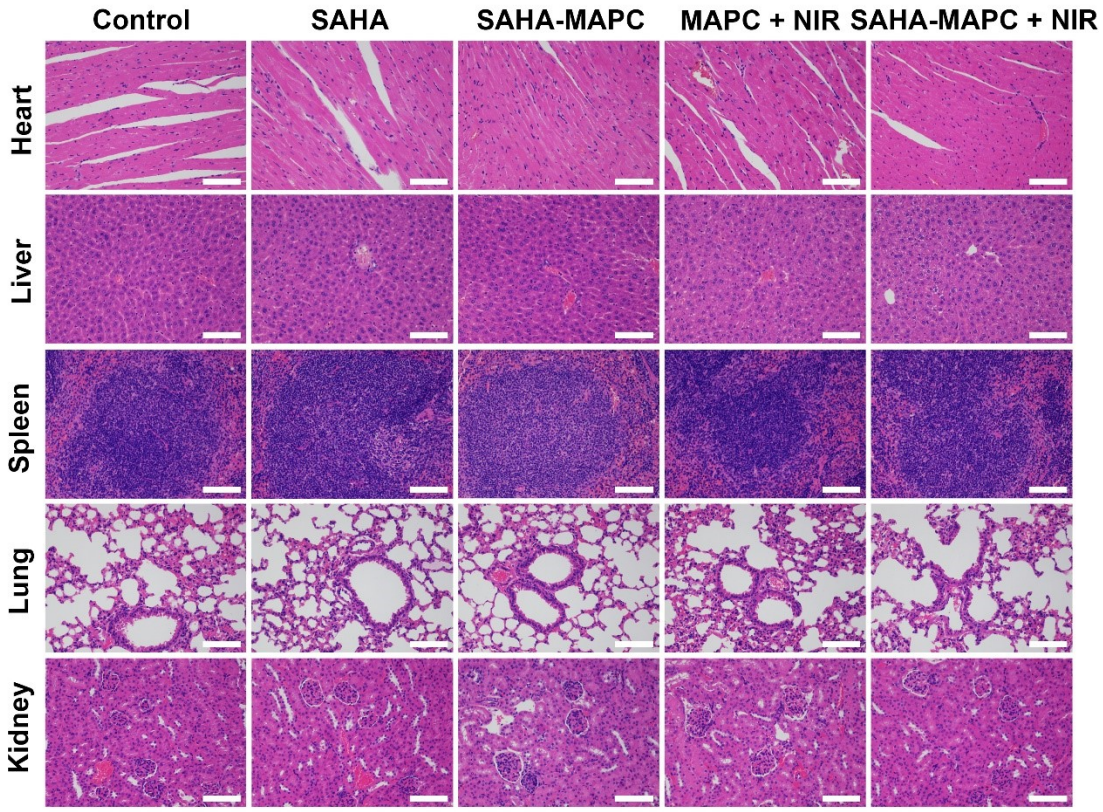

Fig. S13. Histological images of major organs collected after therapy. The scale bar represents 100 μm.

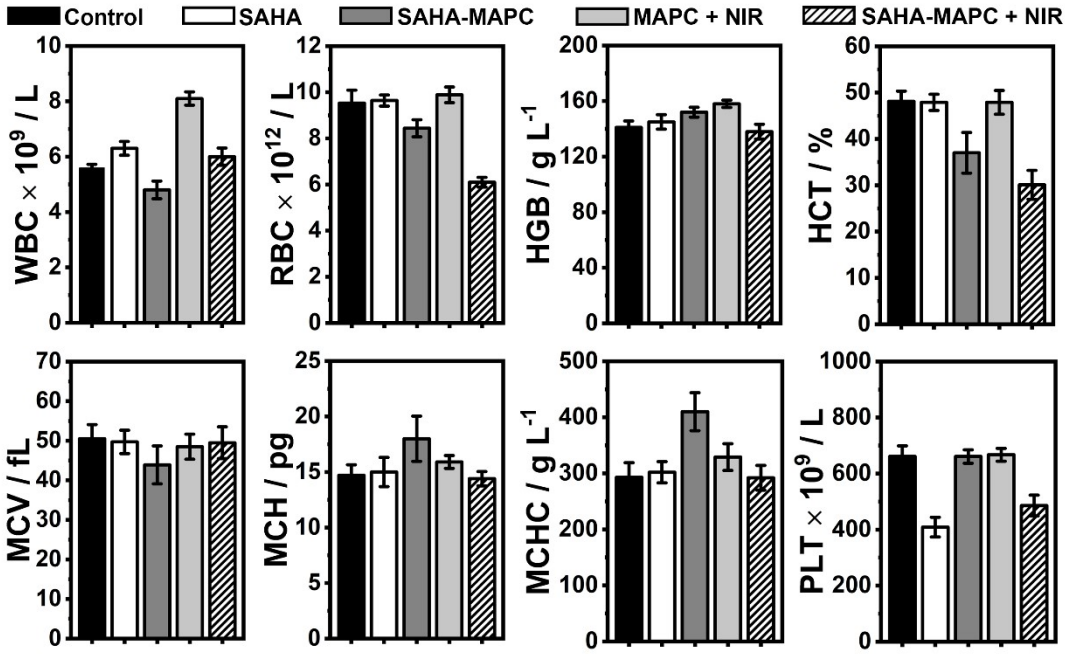

Fig. S14. Hematological index of the mice in all groups. The results show the mean and SD of WBC, RBC, HGB, HCT, MCV, MCH, MCHC, and PLT.

Reference

1 Y. Zhou, Q. Xu, T. Ge, X. Zheng, L. Zhang and P. Yan, *Angew. Chem. Int. Ed.*, 2020, **59**, 3322-3328.

2 H. Lin, Y. Wang, S. Gao, Y. Chen and J. Shi, *Adv. Mater.*, 2018, **30**, 1703284.