Supporting Information

Metallic Ti_3O_5 Hierarchical Porous Microspheres with Enhanced Photothermal Property

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1. Caculation of Photothermal Conversion Efficiency of γ-Ti_3O_5 HPMs

According to the Beer-Lambert Law, the mass extinction coefficient α of the γ-Ti_3O_5 HPMs can be calculated using equation (1):

$$A = \alpha LC \qquad (1)$$

In equation (1), A refers to the absorbance of γ-Ti_3O_5 HPMs at 808 nm, α is the mass extinction coefficient of γ-Ti_3O_5 (L g^{-1} cm^{-1}), L is the optical length of the quartz cuvette (cm), and C is the mass concentration (g L^{-1}). According to Figure S5, the calculated mass extinction coefficient of Ti_3O_5 is 0.87 L g^{-1} cm^{-1}.

The photothermal conversion efficiency (η) of the γ-Ti_3O_5 HPMs was determined by equation (2) as the previous reports[31,42,43]. The temperature change of the γ-Ti_3O_5 aqueous solution (1 mg mL^{-1}) was recorded as a function of time under continuous irradiation of 808 nm NIR laser at a power of 1 W cm^{-2}, in which the irradiation lasted for 600 s, and then the laser was shut off (figure 4e,f).

$$\eta = \frac{hS(T_{max} - T_{surr}) - Q_{Dis}}{I(1 - 10^{-A_{808}})} \qquad (2)$$

Following the previous reports, the value of hS can be calculated by equation (3) - (5). The T, T_{max} and T_{sur} are random temperature, the maximum temperature after irradiation and the surrounding temperature. In this work, we measured the temperature change at concentration of 1mg/mL, the T_{max} - T_{surr} = 45.3 °C, and the τ_s was calculated to be 345.82 s by equation (3) and (4) as Figure 4 e and f. m and C_p in equation (5) are the mass and heat capacity of solvent (water). In this work m=1 g, C = 4.2 J g^{-1} °C. The hS value was determined to be 11.93 mW / °C.

$$\theta = \frac{T - Tsur}{Tmax - Tsur} \quad (3)$$

$$t = \tau s \ln\theta \quad (4)$$

$$hS = \frac{\sum_i miCp,i}{\tau s} \quad (5)$$

Take the hS value into equation (2). At concentration of 1 mg/mL γ-Ti_3O_5 HPMs, A_{808}=0.865. Q_{Dis} expresses the heat dissipated due to light absorption by the pure water without γ-Ti_3O_5. It is measured to be 15.96 mW. *I* is the incident laser power (1000 mW). Substituting these values into equation (2), the 808 nm laser photothermal conversion efficiency (η) of γ-Ti_3O_5 HPMs can be calculated to be 65.29 %.

Supporting Figures

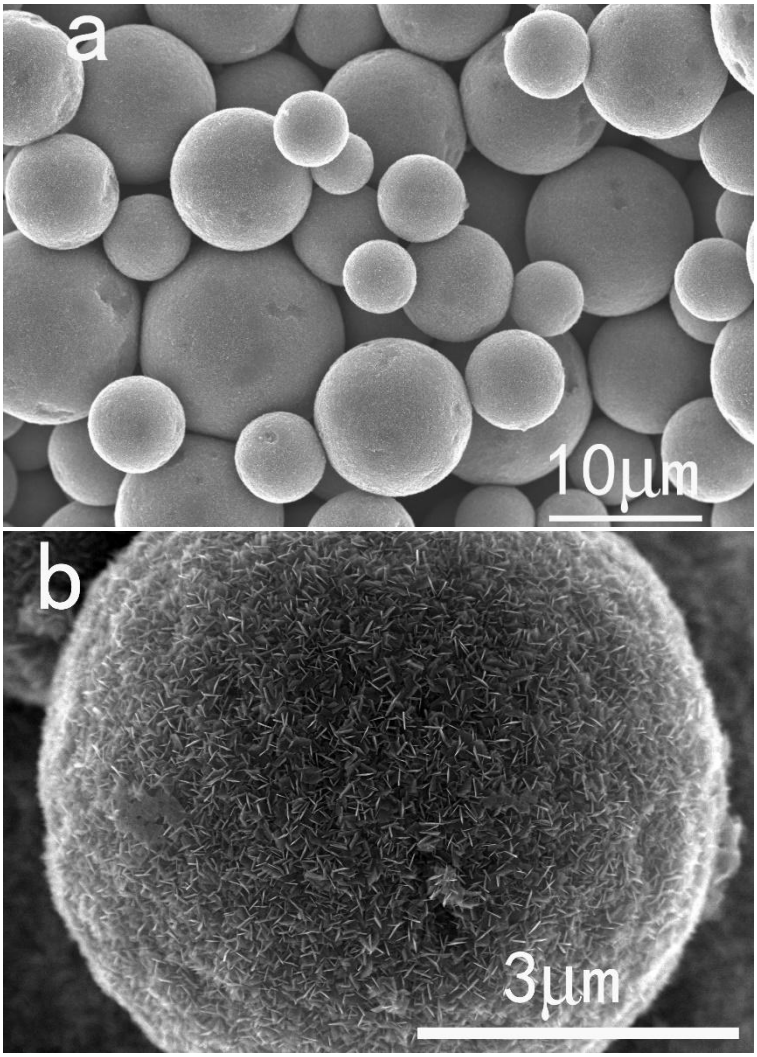

Figure S1. SEM images of the as-synthesized TiO_2 HPMs.

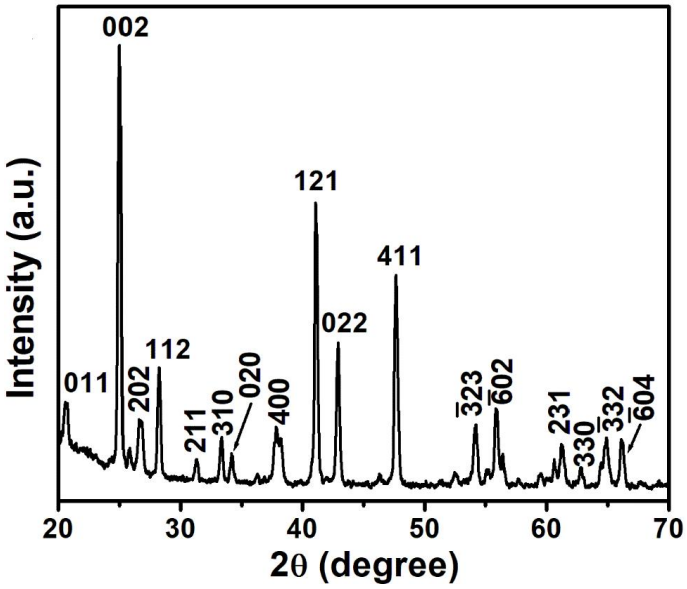

Figure S2. XRD pattern of the γ-Ti_3O_5 HPMs.

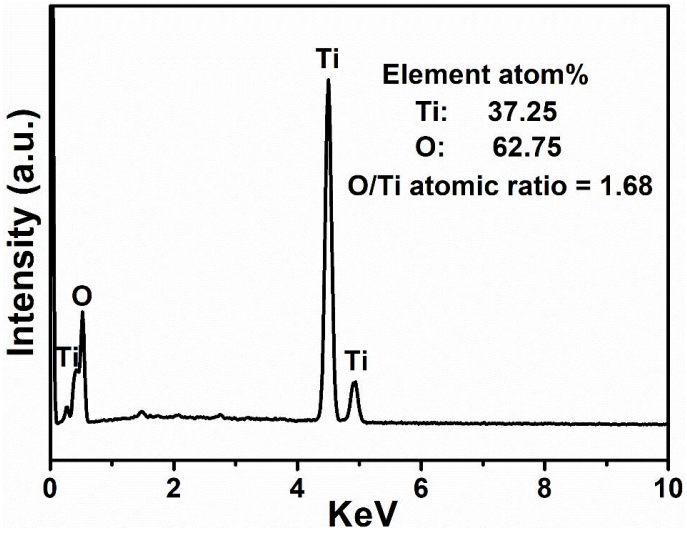

Figure S3. EDS spectrum of the γ-Ti_3O_5 HPMs.

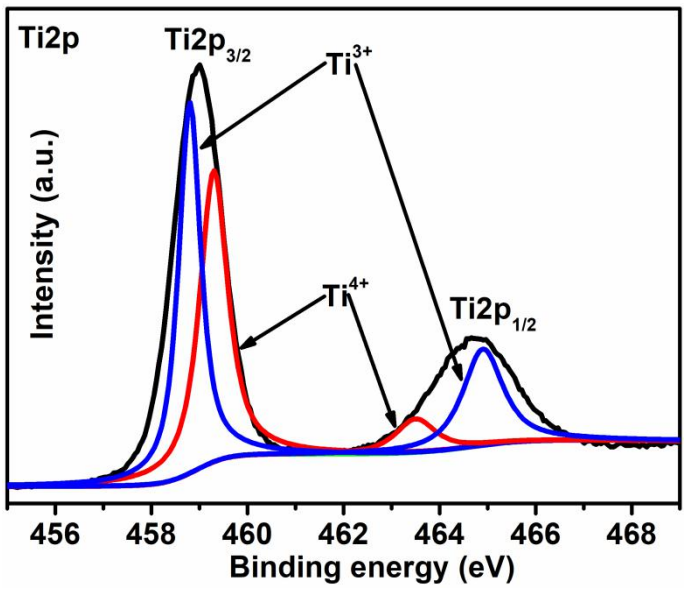

Figure S4. Ti2p XPS spectrum of the γ-Ti_3O_5 nanosheet microspheres, which demonstrates that Ti^{4+} and Ti^{3+} ions coexist in the sample.

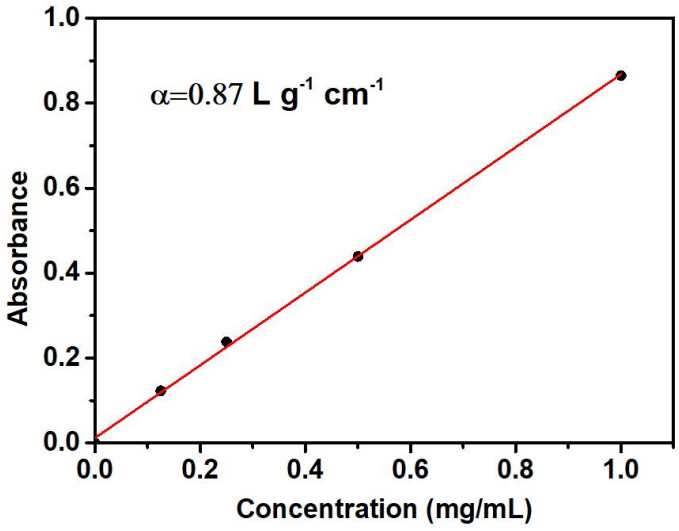

Figure S5. The linearly fitted plots of absorbance versus concentration of γ-Ti_3O_5 aqueous suspension at 808 nm.

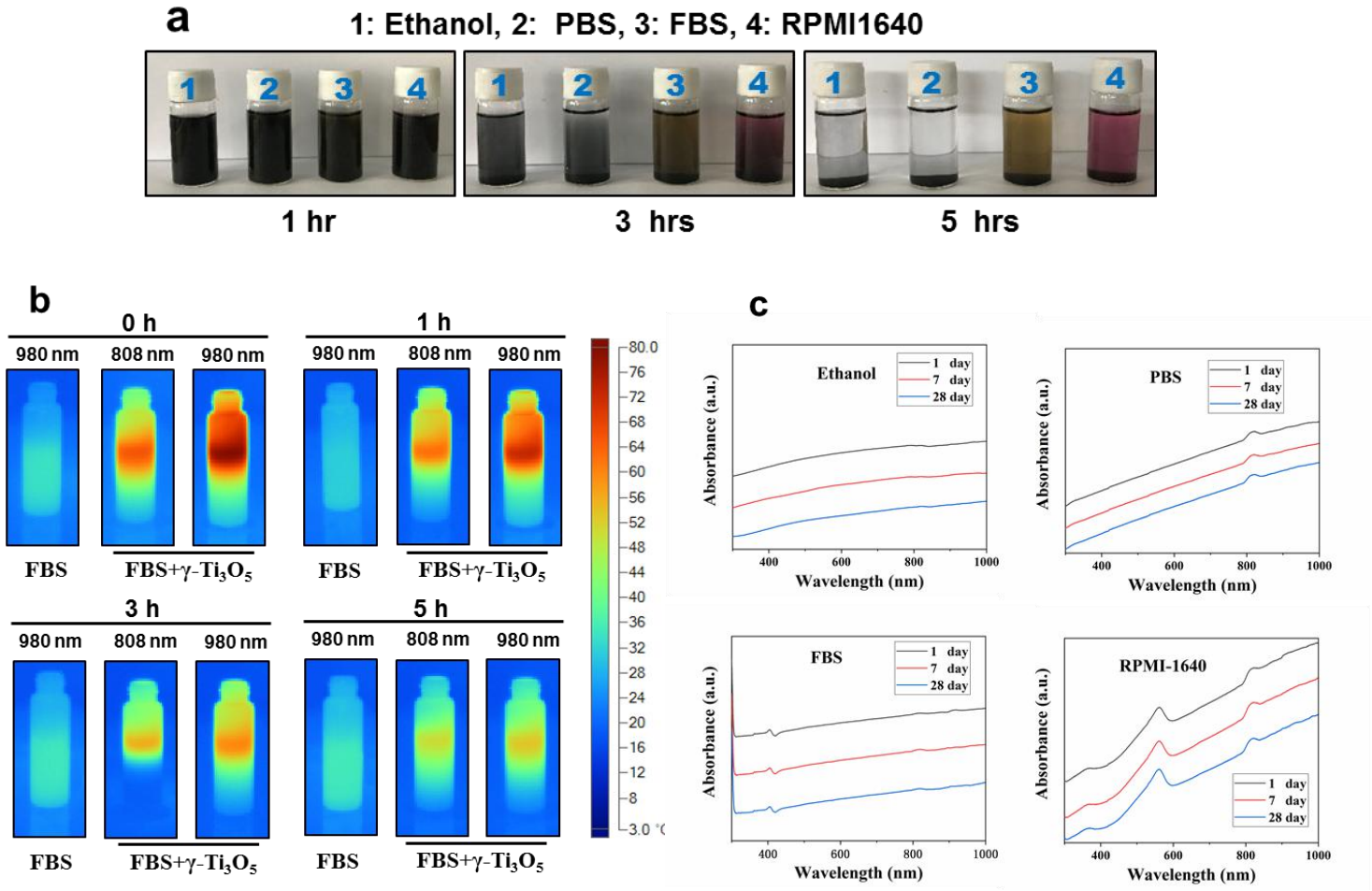

Figure S6. The stability of γ-Ti_3O_5 HPMs in physiological medium PBS, FBS and RPMI1640. a. The aggration and precipation of γ-Ti_3O_5 HPMs keep in room temperature for 1, 3 and 5 hours. b. Photothermal photographs of γ-Ti_3O_5 HPMs dispersed in FBS for 1, 3 and 5 hours after 10 min laser irradiation at the wavelengths of 808 nm and 980nm (2 W cm-2), respectively. c. Absorption spectra of γ-Ti_3O_5 HPMs (200 μg mL^{-1}) dispersed in ethanol, RPMI1640 and FBS for 1, 7 and 28 days.

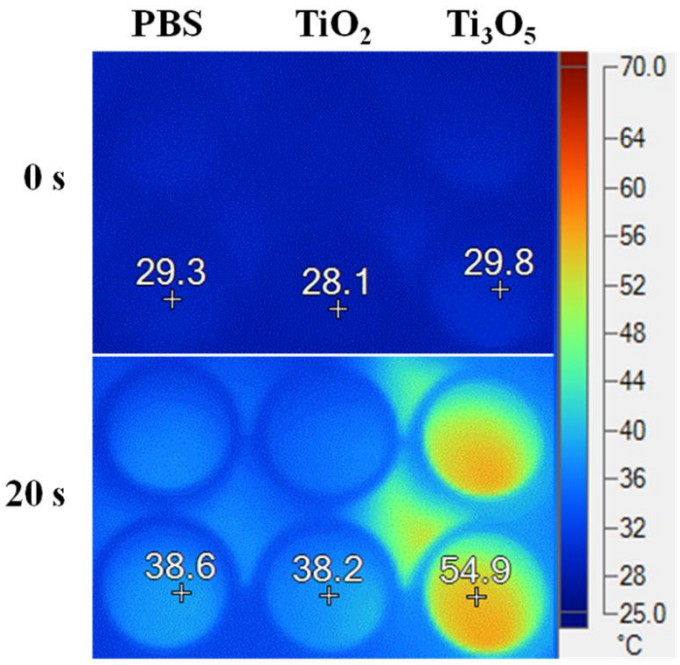

Figure S7. Infrared thermographic maps and temperature increase in wells of control and nanoparticles at different time points (Hela cells exposed to 808 nm laser at 2W).

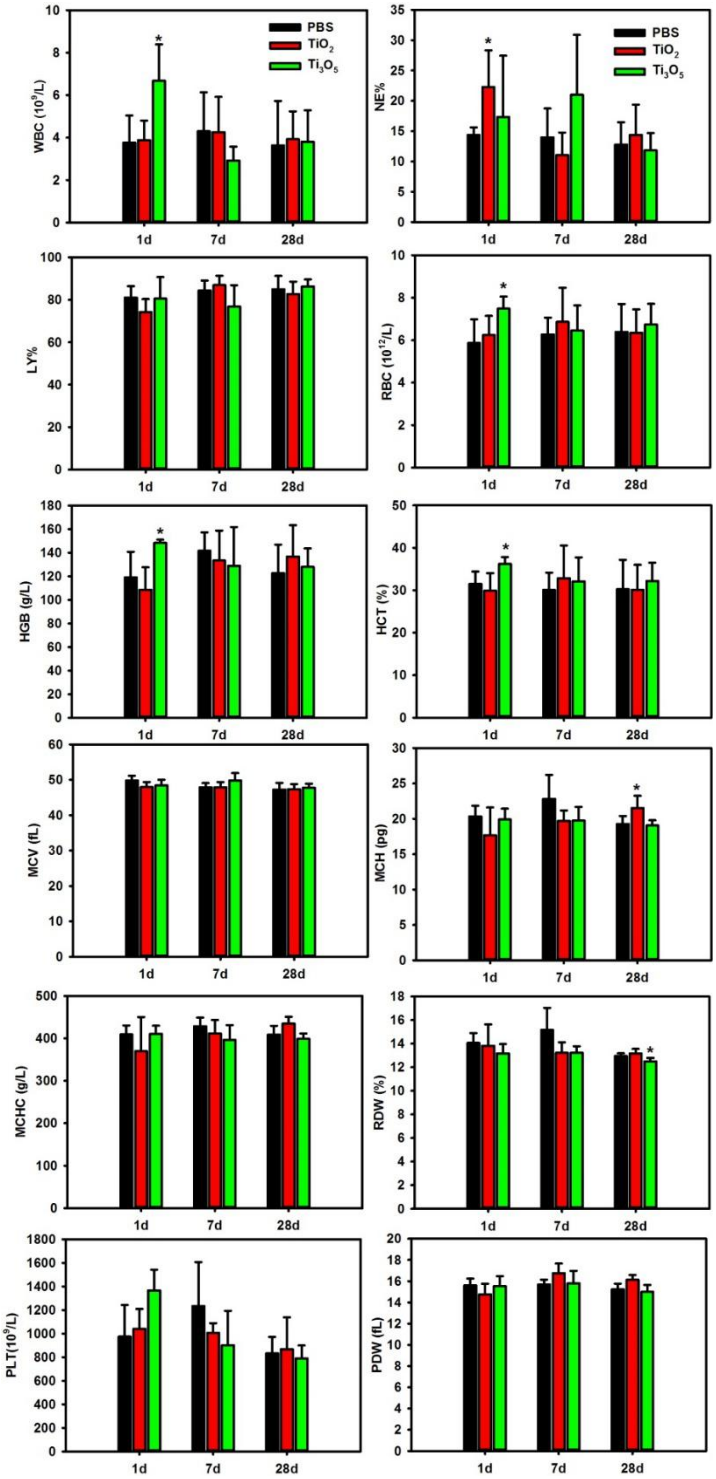

Figure S8. Haematological data of the mice intravenously injected with the γ-Ti_3O_5 HPMs at 1, 7 and 28 days post-injection. The terms are following: white blood cells (WBC), neutrophils (NE), lymphocyte (LY), red blood cells (RBC), haemoglobin (HGB), haematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), red blood cell volume distribution width (RDW), platelets (PLT) and platelet distribution width (PDW).

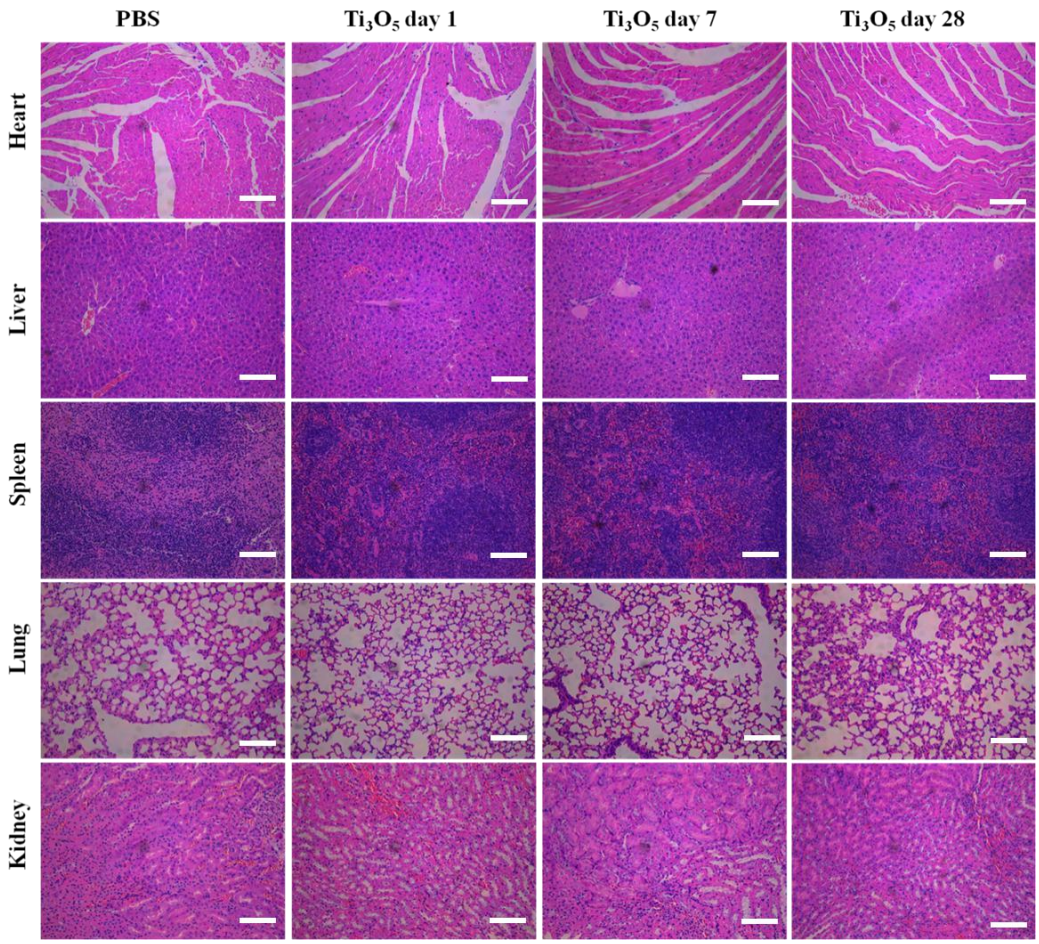

Figure S9. Histological data (haematoxylin and eosin stained images) obtained from the liver, spleen, kidney, heart and lung of the γ-Ti_3O_5 HPM-treated mice at 1, 7 and 28 days post tail vein injection. Scale bar, 100 μm.