Supporting Information

Supplementary Methods

Cytotoxicity and biosafety evaluation

To assess the impact of mTEV on cell viability, DC2.4, RAW264.7 and HUVEC cells were incubated with different concentrations of mTEV for 24 hours. A CCK-8 assay kit was used for cell viability assessment. Hemocompatibility of mTEVs was assessed using a hemolysis assay. Mouse red blood cells were incubated with mTEVs at varying concentrations. Deionized water and saline served as positive and negative controls. Hemolysis rates were determined by measuring absorbance at 541 nm and calculated as follows: Hemolysis (%) = [A(mTEV)-A(Negative)/A(Positive)-A(Negative)] × 100%.

To evaluate the *in vivo* biosafety of mTEV, mice were subjected to different treatments on days 0, 7, and 14, followed by serum biochemical analyses, blood routine tests and H&E staining of major organs.

Protein analysis in mTEV

TEVs and mTEVs were dispersed in RIPA buffer containing 1 mM PMSF protease inhibitor and lysed for 15 minutes for protein extraction. The lysate solution was centrifuged at 12,000*g* for 5 minutes at 4°C, and the supernatant was collected. The protein concentration in the supernatant was determined using a BCA assay kit. Loading samples were prepared with Laemmli sample buffer (Bio-Rad), and proteins were denatured at 95°C for 10 minutes. 20 μg of protein per well was loaded for SDS-PAGE analysis using a Stain-Free™ Precast Gel (Bio-Rad #4568094).

Tumor growth inhibition efficiency calculation

The tumor growth inhibition (TGI) efficiency was calculated using the formula: TGI = (1 − T/C) × 100%, where T represents the tumor volume of the various treatment groups at the endpoint, and C denotes the tumor volume of the control group at the endpoint.

Bioluminescence imaging

The growth of intraperitoneal ID8-luc tumors in mice was monitored by *in vivo* bioluminescence IVIS Spectrum system and Living Image software (IVIS Lumina K Series). Mice were intraperitoneally injected with d-luciferin potassium solution (15 mg ml^{-1}), and bioluminescence images were acquired after 10 minutes.

To assess the presence of free ID8-luc tumor cells in the abdominal cavity of mice, ascites was collected from mice in different treatment groups and mixed with d-luciferin potassium solution (15 mg ml^{-1}) for 10 minutes to obtain bioluminescence images. Luminescence signals were quantified using IVIS Living Image software as the average radiance (p^{-1} s^{-1} cm^{-2} sr^{-1}).

Supplementary Figures

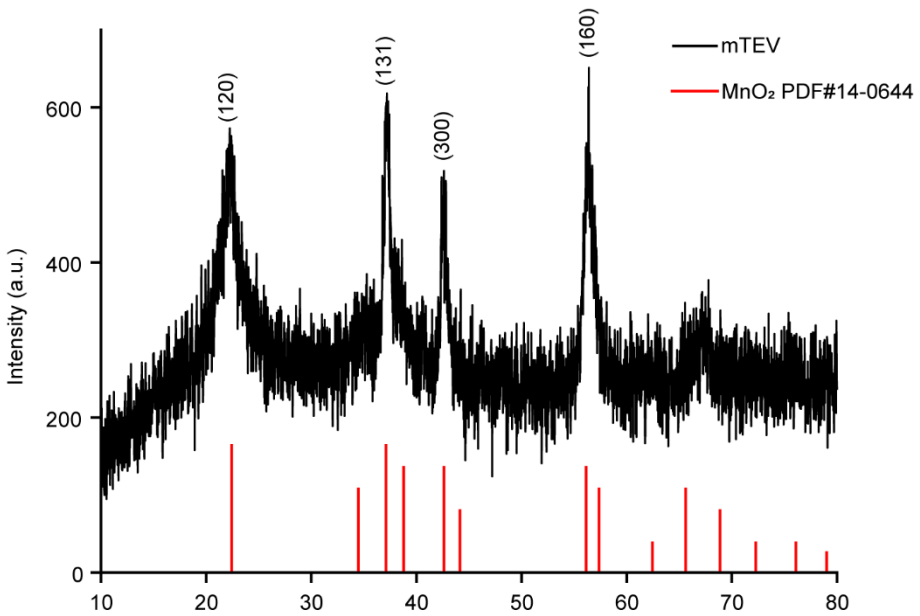

Figure S1. XRD pattern of mTEV nanoparticles. Wide-angle X-ray diffraction (XRD) measurements were utilized to characterize mTEV in the range of 2θ from 10° to 80°.

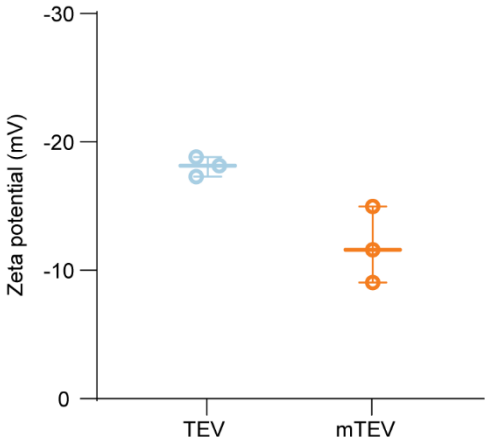

Figure S2. Zeta potentials of TEVs and mTEVs measured by ZetaPALS.

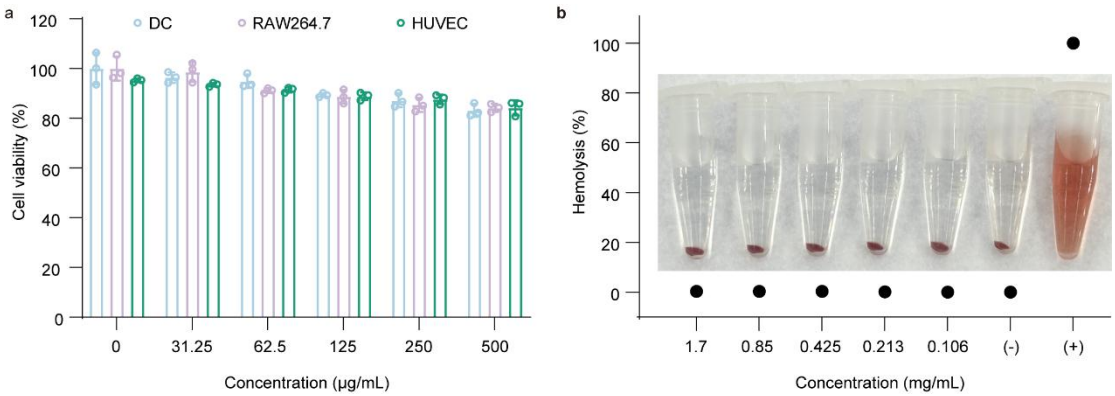

Figure S3. In vitro biosafety evaluation of mTEV. **a** Cell viability of DC, RAW264.7 and HUVEC cells after treatment with different concentrations of mTEV (n=3). For the cell viability assays, mTEVs were administered at doses of 31.25 μg, 62.5 μg, 125 μg, 250 μg, and 500 μg, corresponding to Mn doses of 17.4 μg, 34.8 μg, 69.7 μg, 139.4 μg, and 278.7 μg. Data are presented as mean ± s.d. **b** Hemolysis rate of mTEV at different concentrations, with deionized water as the positive control and normal saline as the negative control. Representative images for each concentration treatment group are shown. Hemolysis was not observed in mTEV at all tested concentrations (n=3). For the hemolysis assays, mTEVs were administered at doses of 0.106 mg, 0.213 mg, 0.425 mg, 0.85 mg, and 1.7 mg, corresponding to Mn doses of 0.094 mg, 0.188 mg, 0.375 mg, 0.75 mg, and 1.5 mg.

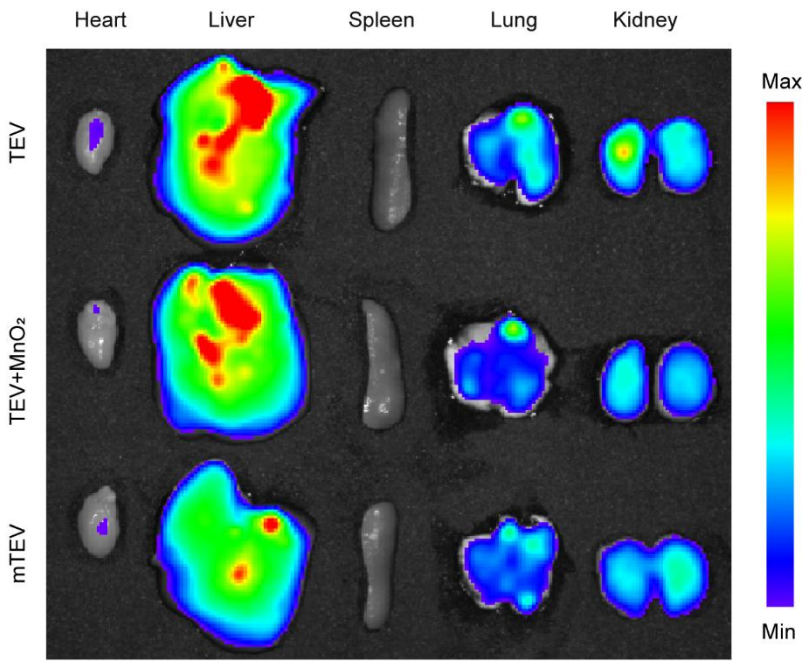

Figure S4. Biodistribution of intraperitoneal injected DiD-tagged TEVs or mTEVs from different treatment groups in organs.

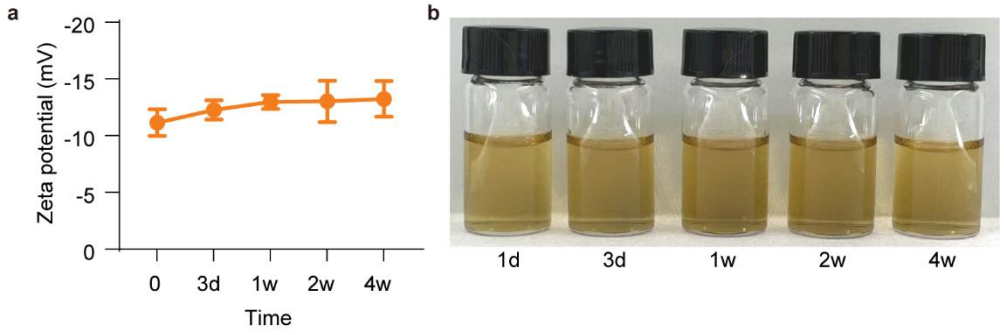

Figure S5. Stability of mTEV nanoparticles. Zeta potentials (**a**) and representative images (**b**) of mTEV after storage at 4 ℃ for various time periods, including 0 day, 3 days, 1 week, 2 weeks, and 4 weeks.

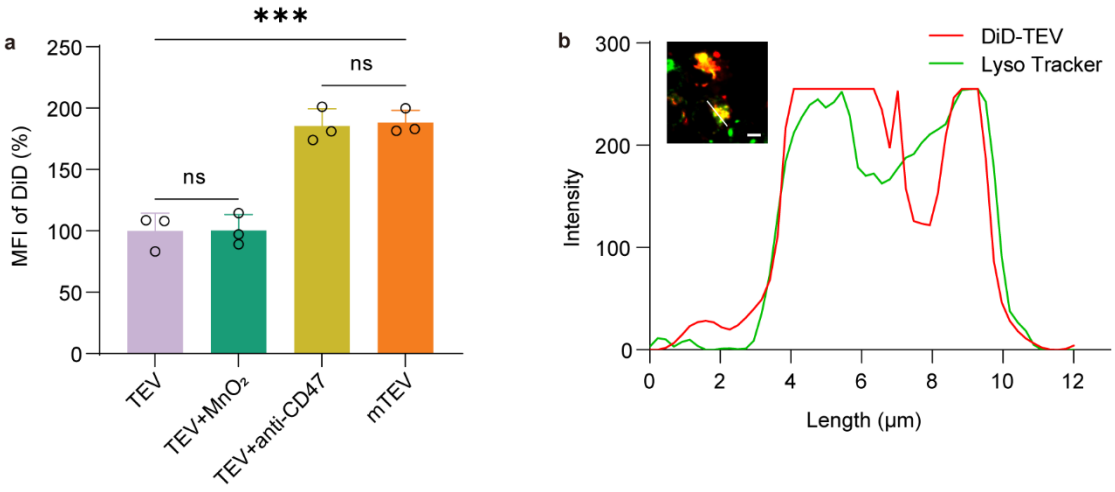

Figure S6. Analysis of mTEV internalization and colocalization with lysosomes in BMDCs. **a** Quantification of the antigen uptake by DCs from mean fluorescence intensity (MFI) by confocal microscopy. Statistical significance was calculated by one-way ANOVA test. Data are presented as mean ± s.d. **b** The quantitative analysis of the colocalization of mTEV and lysosomes.

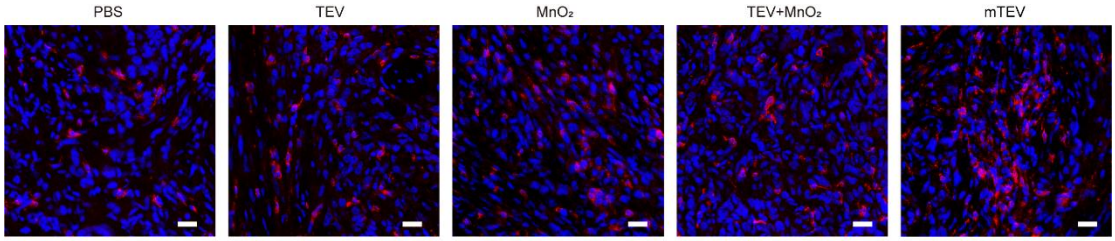

Figure S7. Representative immunofluorescence images of $CD8^+$T cells in tumor tissues from different mice after different treatments. Scale bar, 20μm.

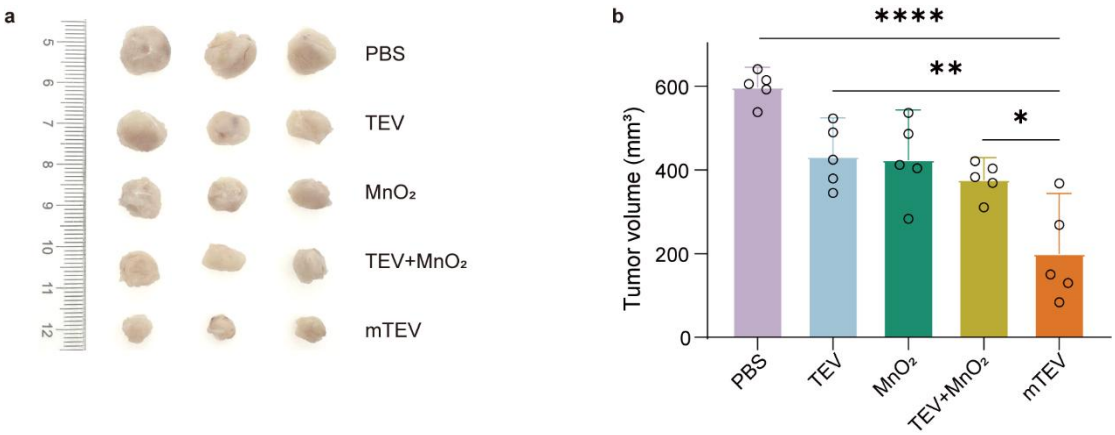

Figure S8. Representative photographs of 3 tumors from each treatment group (randomly chosen from 5 mice per group) (**a**) and quantification of tumor volumes (**b**) (n=5). Statistical significance was calculated by one-way ANOVA test. Data are presented as mean ± s.d.

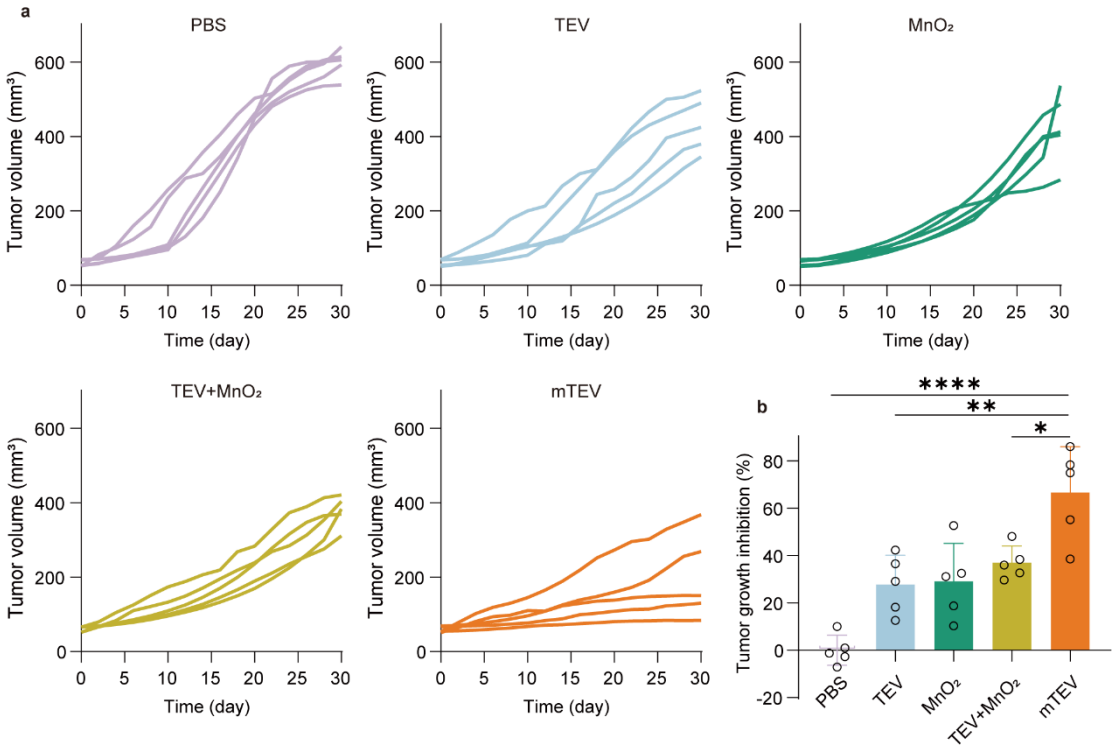

Figure S9. **a** Individual tumor growth curves for ID8 tumors on mice after different treatments (n=5). **b** TGI of ID8 ovarian cancer by different treatments (n=5). Statistical significance was calculated by one-way ANOVA test. Data are presented as mean ± s.d.

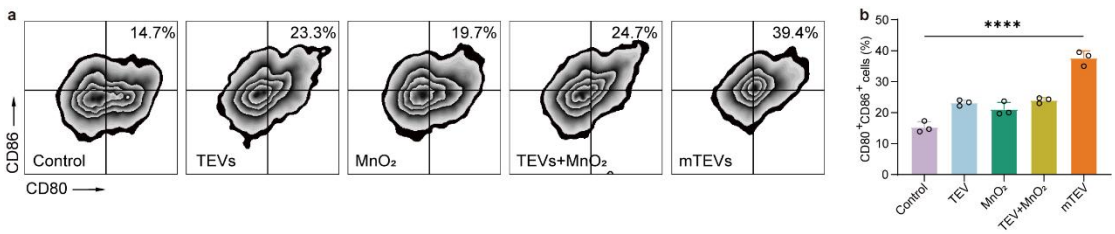

Figure S10. Flow cytometry analysis (**a**) and quantification (**b**) of matured DCs ($CD11c^+CD80^+CD86^+$) in LNs from ID8 intraperitoneal tumor-bearing mice after different treatments (n=3). Statistical significance was calculated by one-way ANOVA test. Data are presented as mean ± s.d.

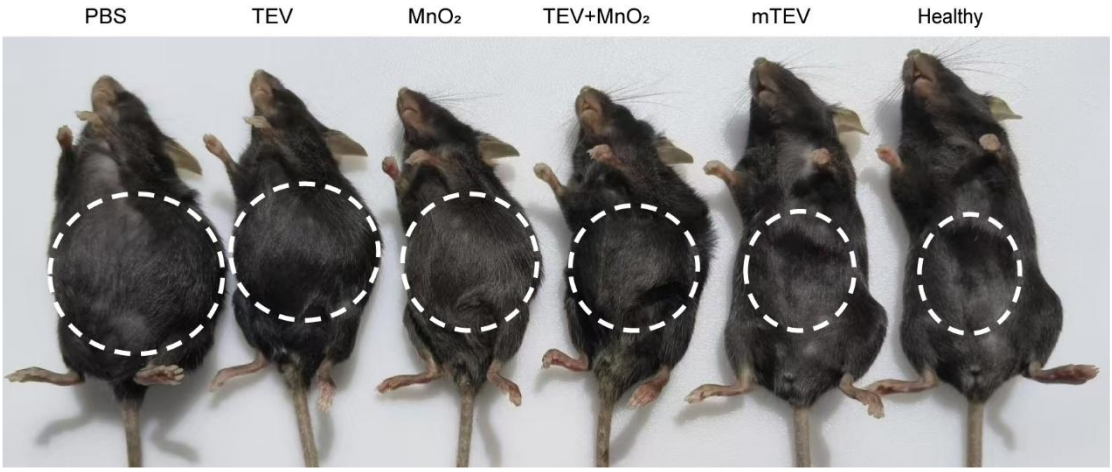

Figure S11. Representative images of ID8 intraperitoneal metastatic ovarian cancer mice after different treatments.

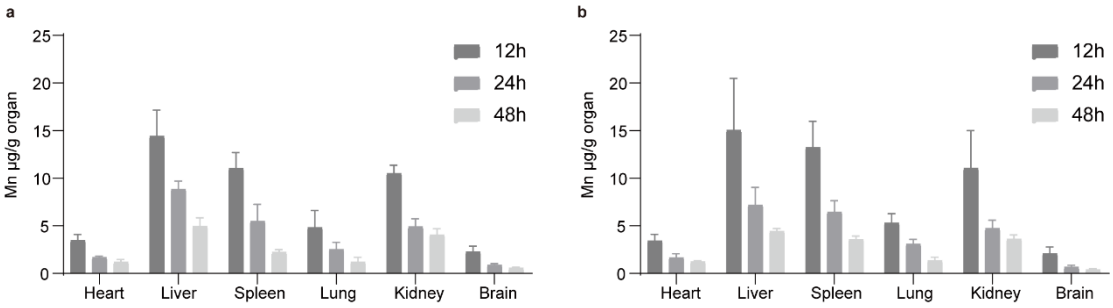

Figure S12. Mn biodistribution in mouse organs following mTEV nanoparticle administration. (**a**) Biodistribution profile in mice receiving subcutaneous injection of mTEVs; (**b**) Biodistribution profile in mice receiving intraperitoneal injection of mTEVs. Mn concentrations in the heart, liver, spleen, lung, kidney, and brain of mice were quantified via ICP-MS at 12h, 24h, and 48h post-injection of mTEV nanoparticles. Data are presented as mean ± s.d.

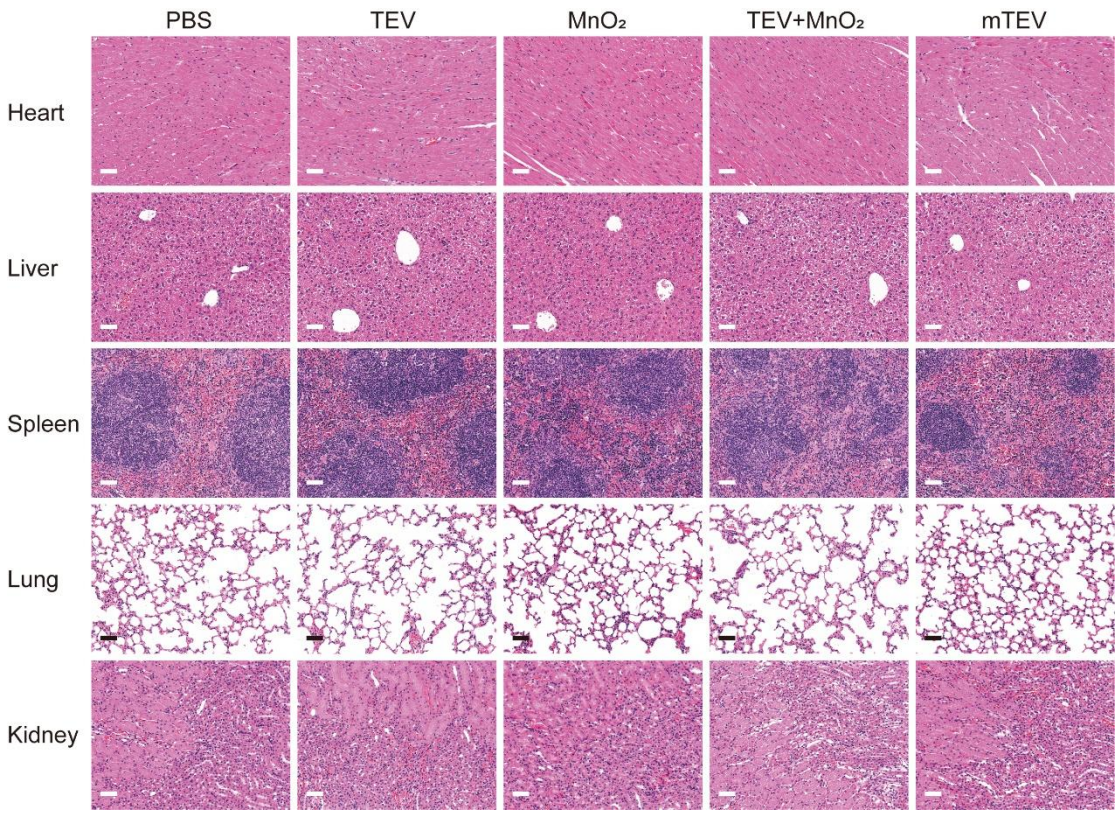

Figure S13. H&E staining of the major organs (heart, liver, spleen, lung and kidney) at the end of the experiments. The mice were treated by intraperitoneal injection. Scale bar, 50 μm.

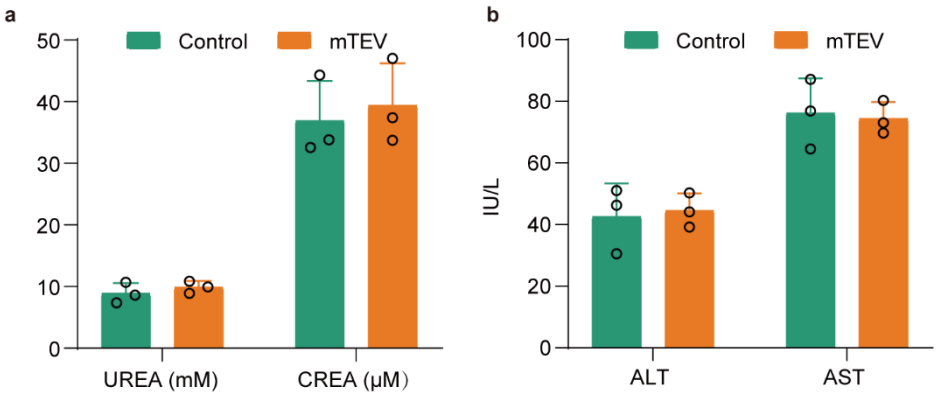

Figure S14. Serum biochemical parameters of mice in mTEV-treated and control (PBS-treated) groups. Levels of urea (UREA), creatinine (CREA) (**a**), alanine aminotransferase (ALT), and aspartate aminotransferase (AST) (**b**) were quantified (n=3).

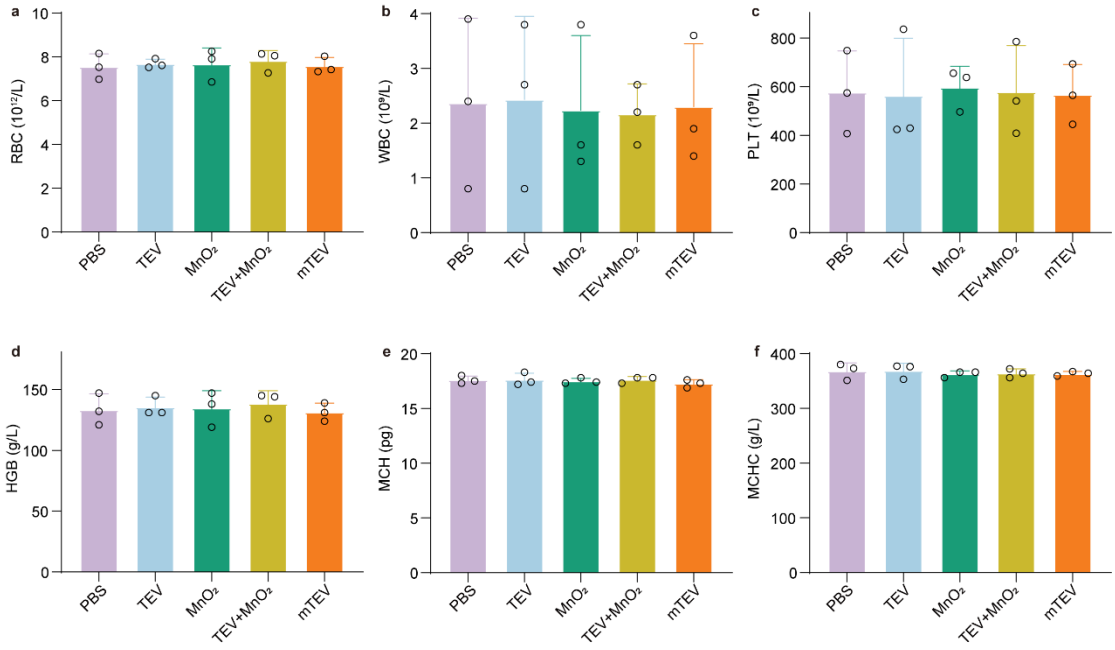

Figure S15. Blood routine indices of mice in each treatment group. Levels of RBC (red blood cells) (**a**), WBC (white blood cells) (**b**), PLT (platelets) (**c**), HGB (hemoglobin) (**d**), MCH (mean corpuscular hemoglobin) (**e**), and MCHC (mean corpuscular hemoglobin concentration) (**f**) were quantified (n=3).