Supporting Information

Bacterial species-identifiable magnetic nanosystems for early sepsis diagnosis and extracorporeal photodynamic blood disinfection

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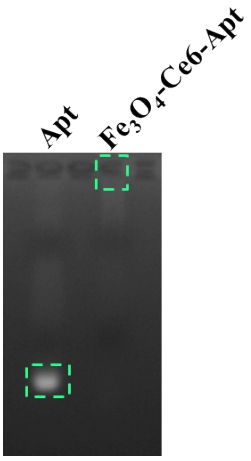

Fig. S1 Agarose gel electrophoresis of the aptamer and Fe_3O_4-Ce6-Apt nanosystem. Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem.

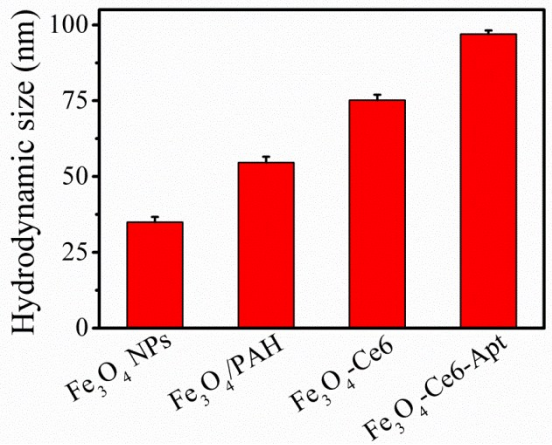

Fig. S2 Hydrodynamic diameters of Fe_3O_4 NPs, Fe_3O_4/PAH, Fe_3O_4-Ce6 and Fe_3O_4-Ce6-Apt in blood. Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem.

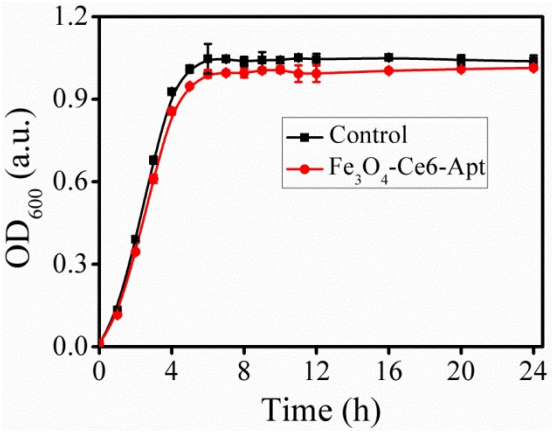

Fig. S3 Growth curve of *S. aureus* bacteria (10^5 CFU) in the presence of Fe_3O_4-Ce6-Apt (50 μg/mL of iron element). Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem, and the growth of *S. aureus* bacteria without Fe_3O_4-Ce6-Apt incubation was used as the control.

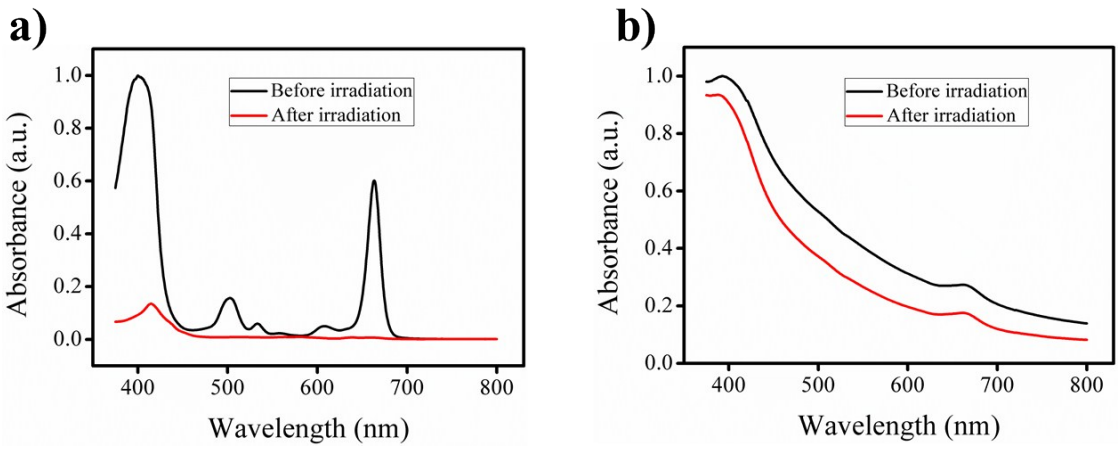

Fig. S4 The changes of absorption spectra of free Ce6 molecules (a) and Fe_3O_4-Ce6-Apt (b) solutions before and after NIR laser (660 nm, 0.8 W/cm^2) irradiation for 5 min. Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem.

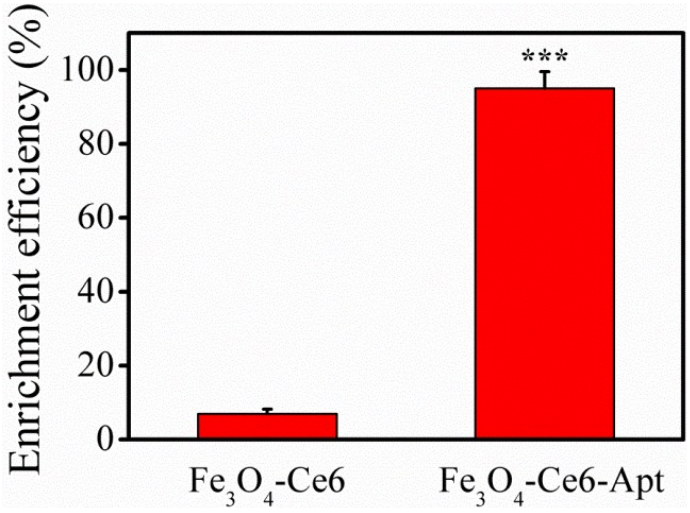

Fig. S5 Quantitative evaluation of the enrichment efficiencies of the Fe_3O_4-Ce6 (50 μg/mL of iron element) and Fe_3O_4-Ce6-Apt nanosystem (50 μg/mL of iron element) toward *S. aureus* (10^6 CFU) bacteria. Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem. The enrichment efficiency is defined as the proportion of bacteria separated from the test blood samples, and its value is given as the mean of three independent experiments and the error bars indicate the SD from the mean. ***P<0.001.

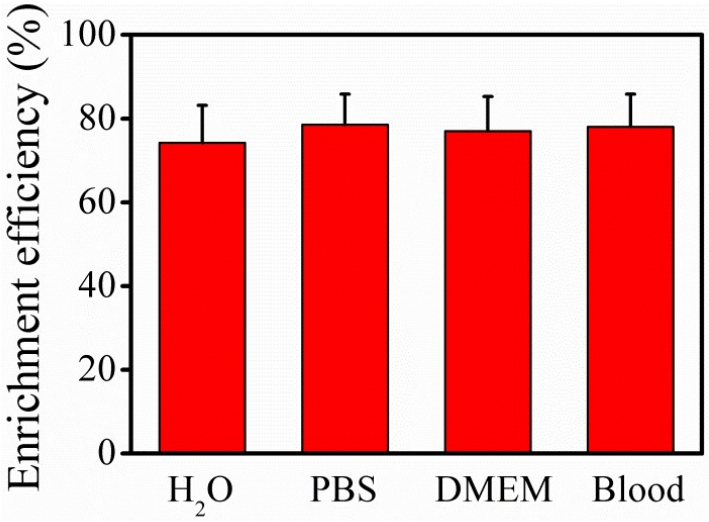

Fig. S6 Quantitative evaluation of the enrichment efficiencie of the Fe_3O_4-Ce6-Apt nanosystems (50 μg/mL of iron element) toward *S. aureus* (10^2 CFU) in four different types of sample medium (DI water, PBS, DMEM and blood). Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem. The enrichment efficiency is defined as the proportion of bacteria separated from the test blood samples, and its value is given as the mean of three independent experiments and the error bars indicate the SD from the mean.

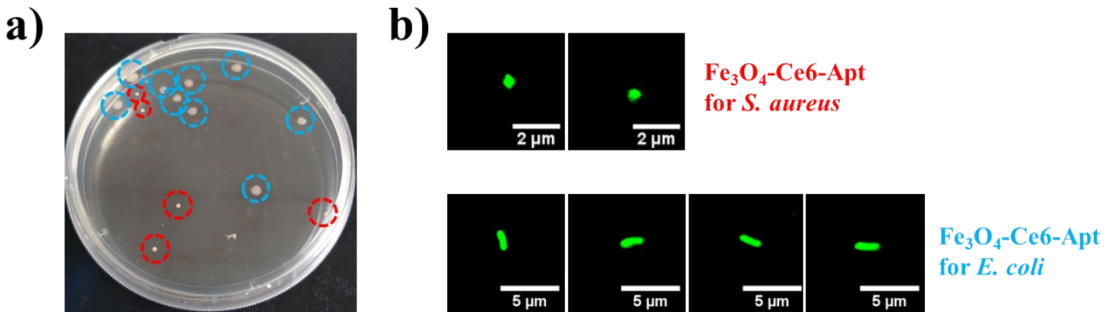

Fig. S7 a) The agar plate result of one blood sample of sepsis caused by the mixture of *S. aureus* and *E. coli* species using the gold standard bacterial blood culture procedure. The red and blue circles represent the bacterial colony of *S. aureus* and *E. coli* grown on the agar plate, respectively. b) The corresponding fluorescence microscopic result of the same sepsis blood samples based on the Fe_3O_4-Ce6-Apt nanosystem-assisted strategy. Here the assay of two Fe_3O_4-Ce6-Apt nanosystems (50 μg/mL of iron element) specific for *E. coli* and *S. aureus* respectively, were used.

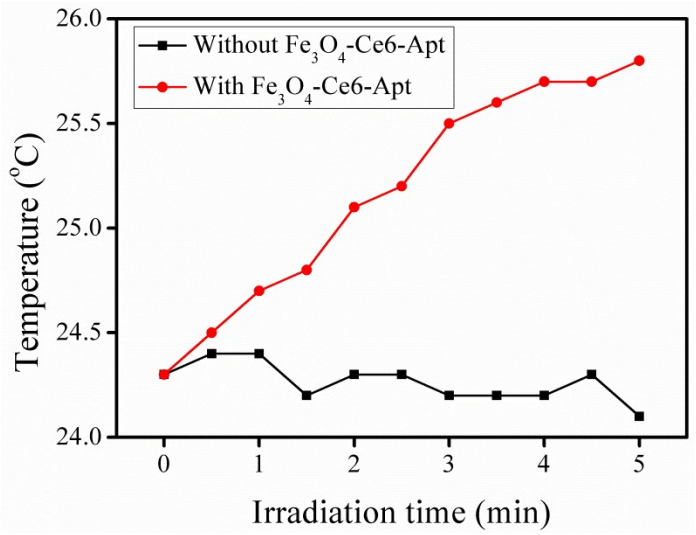

Fig. S8 Temperature curves of mice blood sample (with and without Fe_3O_4-Ce6-Apt nanosystem incubation) under NIR laser (660 nm, 0.8 W/cm^2) irradiation. Here the Fe_3O_4-Ce6-Apt nanosystems (50 μg/mL of iron element) specific for *S. aureus* was used.

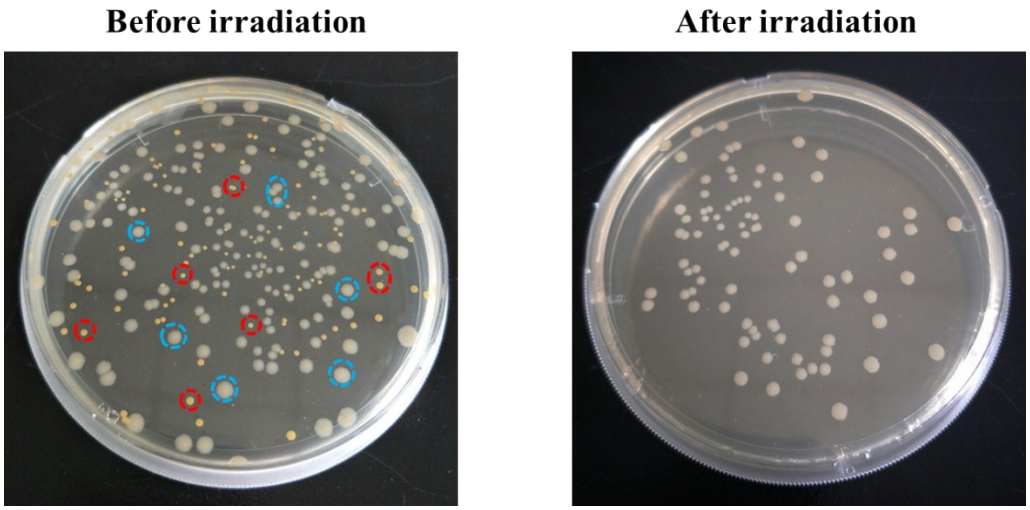

Fig. S9 Agar plate Photographs of the mixed *S. aureus* (10^6 CFU) and *E. coli* (10^6 CFU)-spiked blood sample incubated with Fe_3O_4-Ce6-Apt nanosystem (50 μg/mL of iron element) before and after NIR laser (660 nm, 0.8 W/cm^2) irradiation for 5 min. Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem. The red and blue circles indicate the bacterial colony of *S. aureus* and *E. coli* respectively, using the gold standard bacterial blood culture procedure.

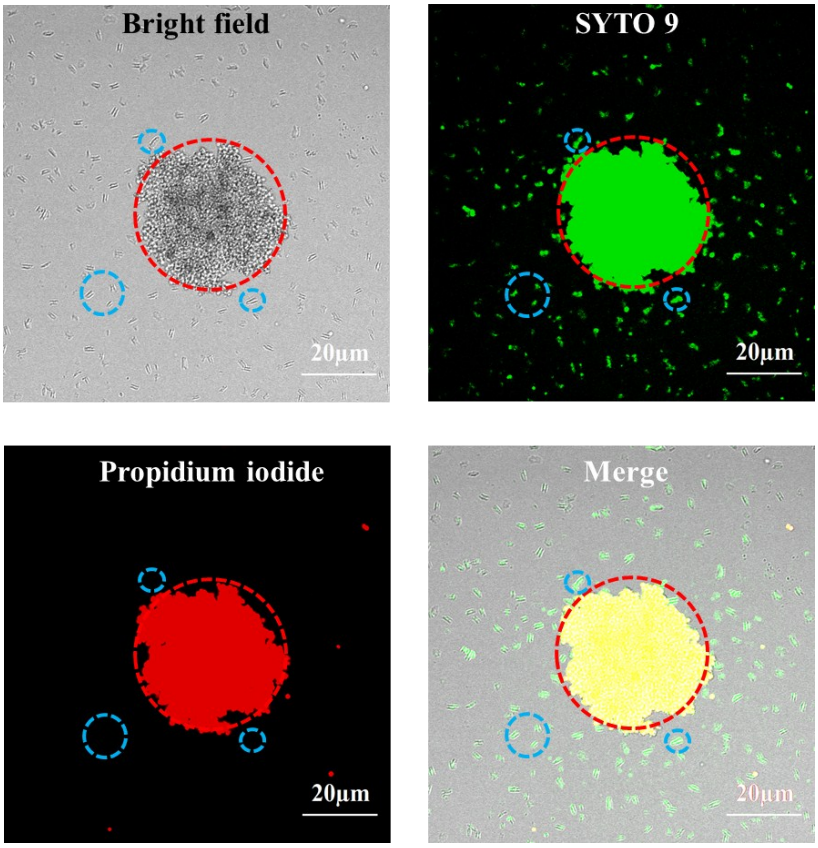

Fig. S10 Representative images for the live/dead bacterial staining assay the mixed *S. aureus* (10^6 CFU) and *E. coli* (10^6 CFU)-spiked blood sample incubated with Fe_3O_4-Ce6-Apt nanosystem (50 μg/mL of iron element) after NIR laser (660 nm, 0.8 W/cm^2) irradiation for 5 min. Here the aptamer toward *S. aureus* was used to prepare the Fe_3O_4-Ce6-Apt nanosystem. Two fluorescent dyes were used in which SYTO 9, with a green color, labeled both live and dead bacteria, while propidium iodide, with a red color, stained only dead bacteria. The red and blue circles indicate the *S. aureus* and *E. coli*, respectively.

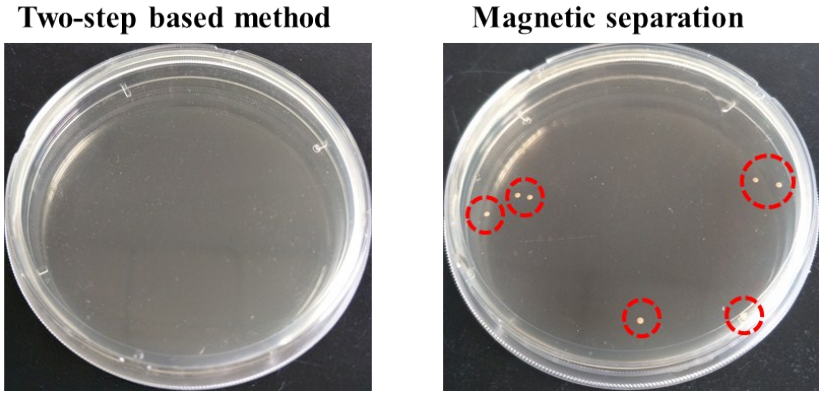

Fig. S11 Agar plate Photographs of the *S. aureus* (10^6 CFU)-spiked blood sample after the two-step based extracorporeal blood disinfection and pure magnetic separation. The red circles indicate the bacterial colony of *S. aureus* grown on the agar plate.

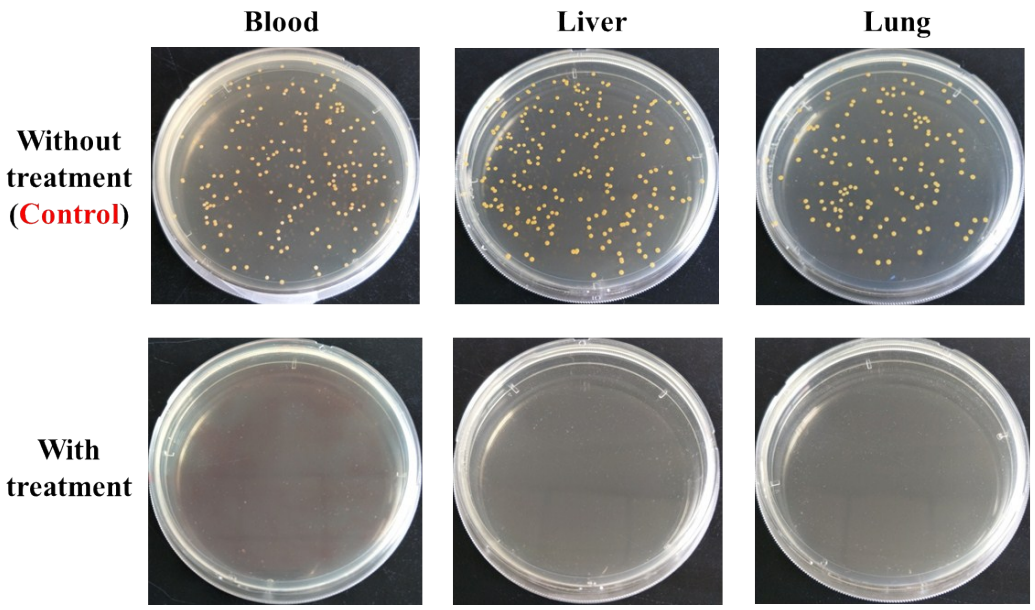

Fig. S12 Agar plate Photographs of bacterial cultures from the blood, liver and lung tissues of mice transfused with the *S. aureus* (10^6 CFU)-spiked blood samples after disinfection treatment at 10 day post-transfusion. The mice transfused with the *S. aureus* (10^6 CFU)-spiked blood samples without disinfection treatment at 4 day post-transfusion were used as the control.