

## Supporting Information

### **Gelatinase-Responsive Release of Antibacterial Photodynamic Peptide against *Staphylococcus aureus***

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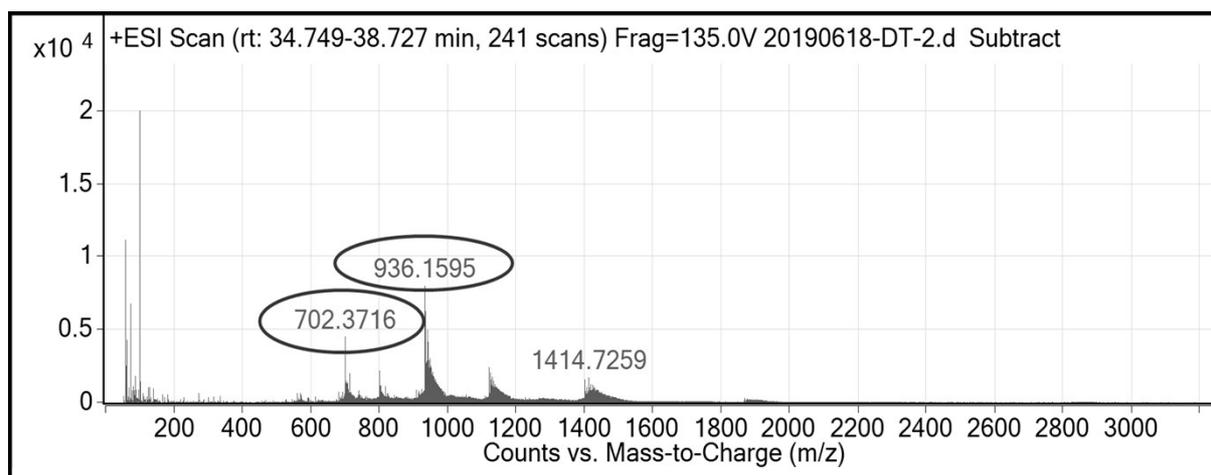
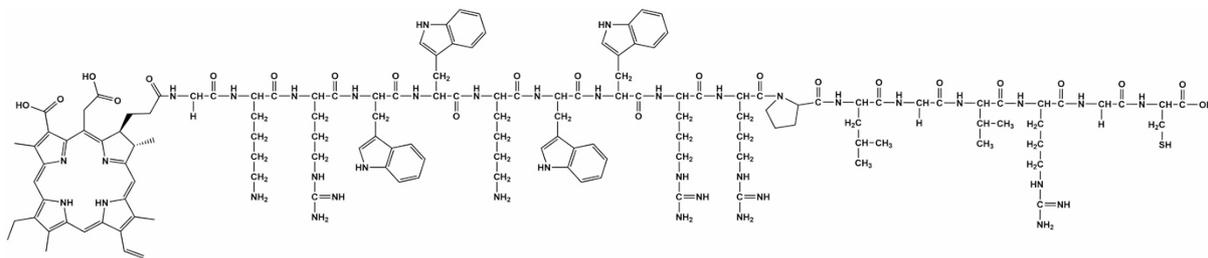
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# These authors contributed equally to this work.

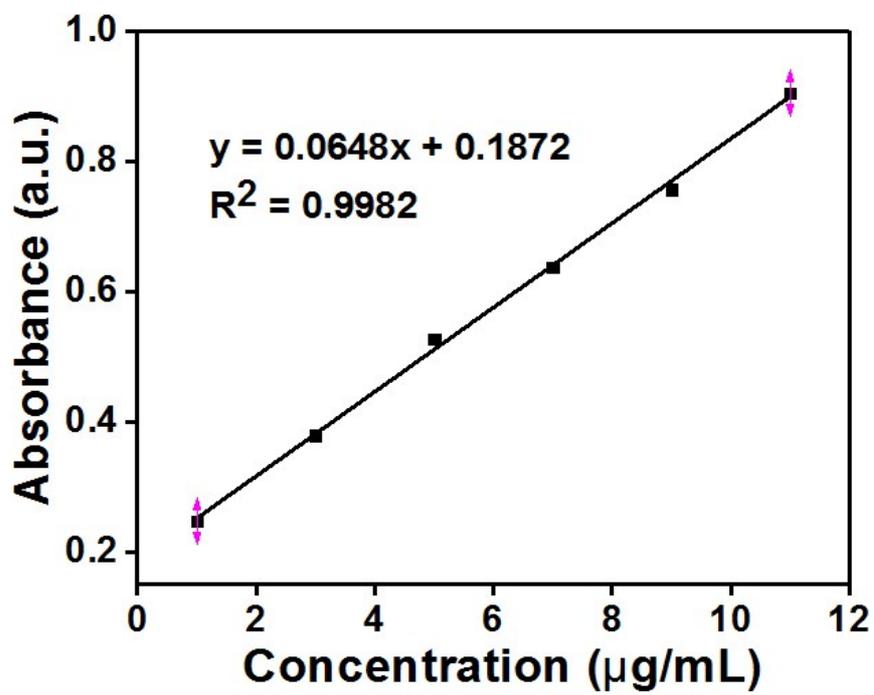
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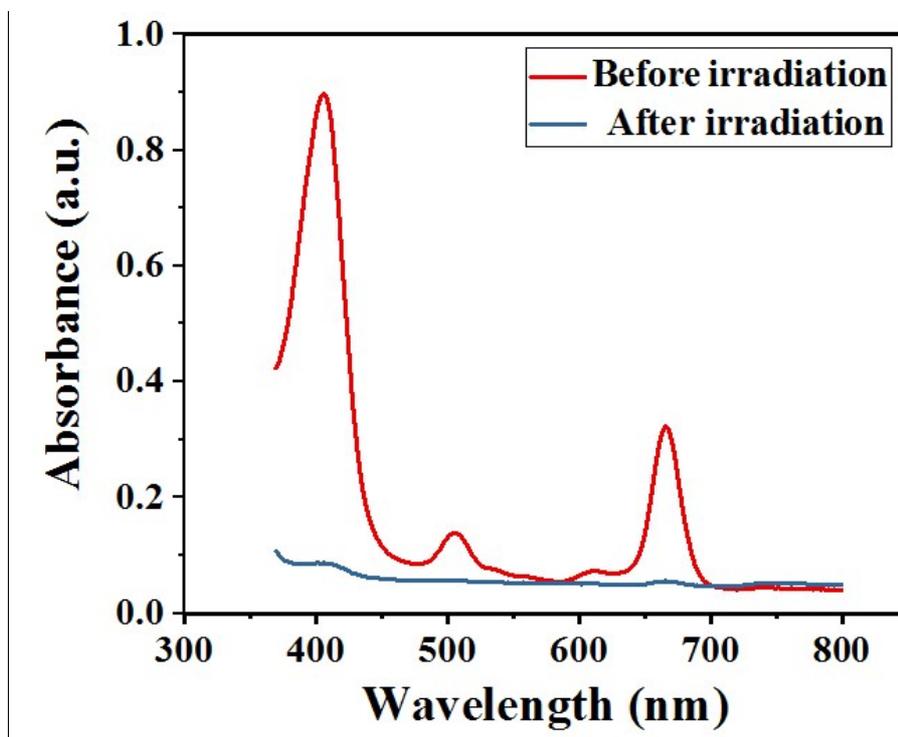
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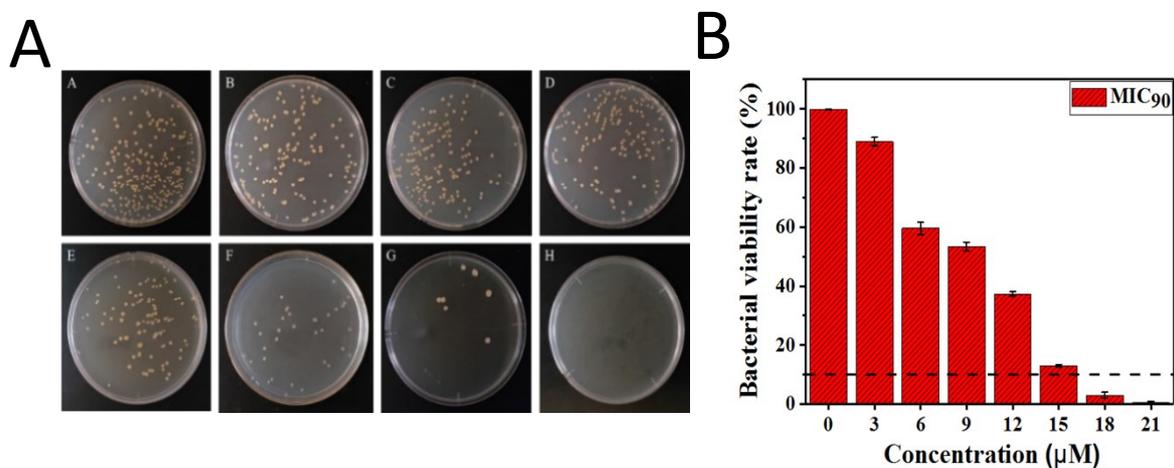
**Figure S1.** Structure and LC-MS spectrum of APP.



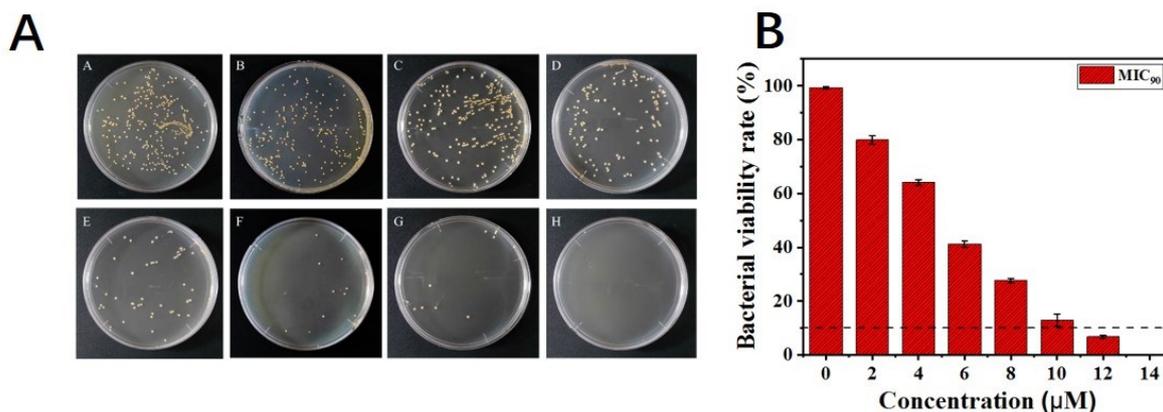
**Figure S2.** The linear calibration curve between Ce6 concentration and UV absorbance at 660 nm.



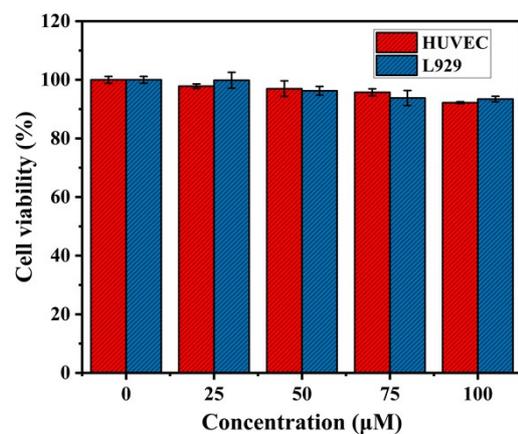
**Figure S3.** Photostability of Ce6 before and after irradiation (660 nm, 0.8W/cm<sup>2</sup>, 5 min).



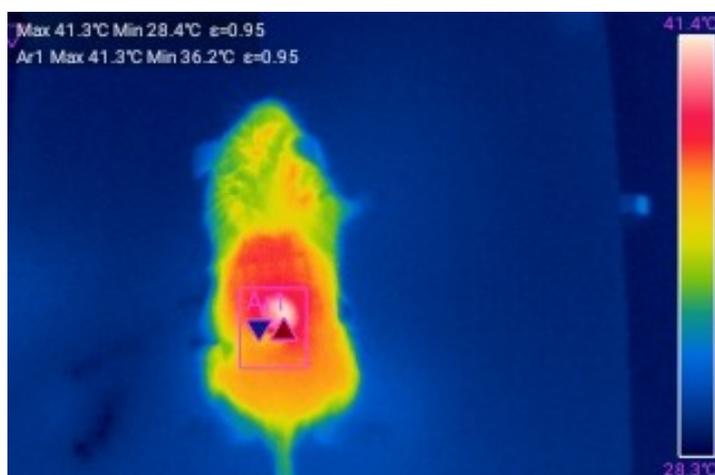
**Figure S4.** Antibacterial activity of the APP against *S. aureus* *in vitro* without IR irradiation. Briefly, *S. aureus* solution ( $10^8$  CFU/mL) was incubated with different concentrations of APP for 1 h, and then 1 mL of mixed bacterial liquid was withdrawn for bacterial culturing at 15 h post incubation. Bacterial colonies (A) and survival rate (B) were depicted as an indication of the inhibitory effect. Data shown are the average of three replicates. The alphabetical order in panel A corresponds to the increased APP concentration of the X-axis in panel B.



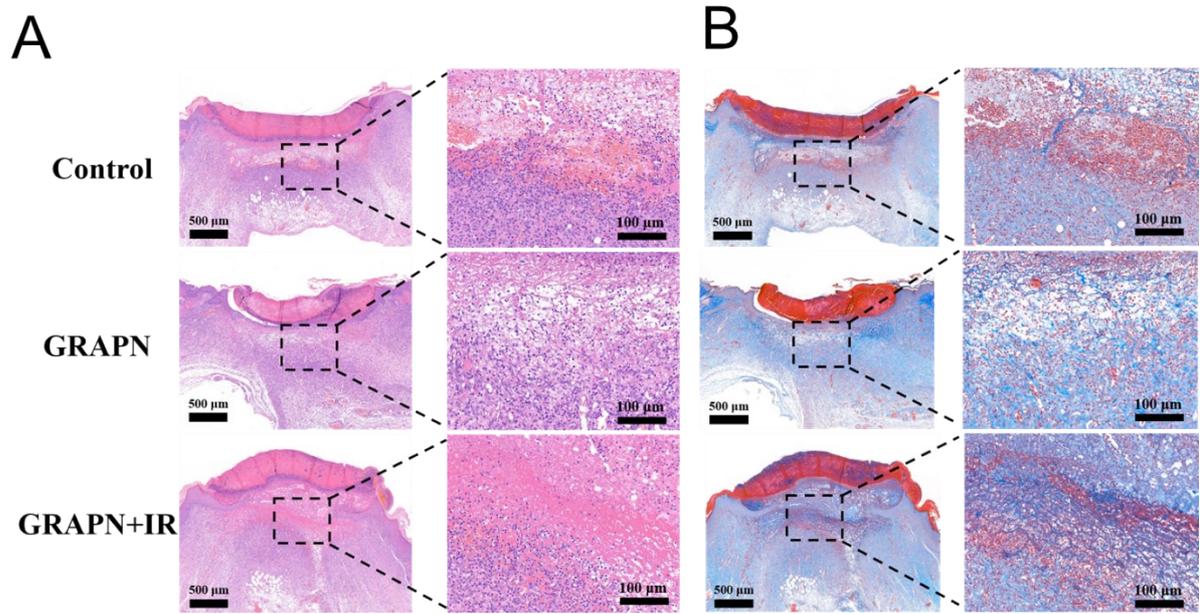
**Figure S5.** Antibacterial activity of the Ce6-GKRWWKWRRPLG peptide against *S. aureus* *in vitro* without IR irradiation. Briefly, *S. aureus* solution ( $10^8$  CFU/mL) was incubated with different concentrations of APP for 1 h, and then 1 mL of mixed bacterial liquid was withdrawn for bacterial culturing at 15 h post incubation. Bacterial colonies (A) and survival rate (B) were depicted as an indication of the inhibitory effect. Data shown are the average of three replicates. The alphabetical order in panel A corresponds to the increased Ce6-GKRWWKWRRPLG concentration of the X-axis in panel B.



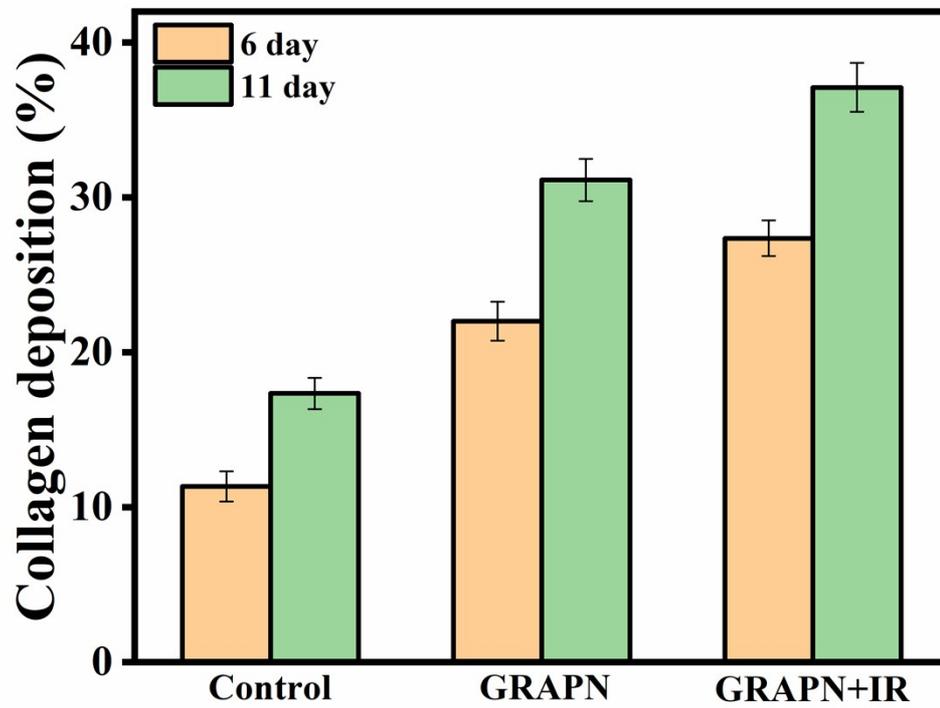
**Figure S6.** The cytotoxicity of GRAPN on HUVEC and L929 cells. Data were expressed as mean standard deviation (n=3).



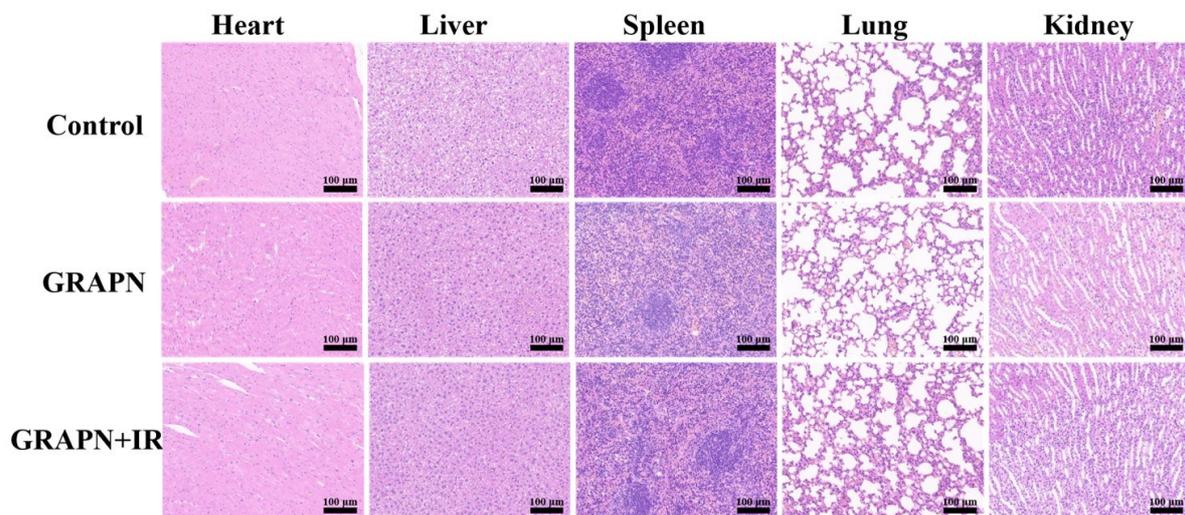
**Figure S7.** Temperature measurement of the wound after IR irradiation. Briefly, a mouse with an open wound received IR irradiation (660 nm, 0.8 W/cm<sup>2</sup>) for 5 min, and an IR camera was used to monitor the temperature of the wound on the back. IR irradiation increased the local temperature on the skin up to 41.3°C.



**Figure S8.** Evaluation of the wound healing at day 6. (A) Representative H&E staining images of the *S. aureus*-infected skin tissues of mice in the Control, GRAPN, and GRAPN + IR treatment groups on the 6th day of treatment. (B) Representative Masson-staining images of the *S. aureus*-infected skin tissues of mice in the three treatment groups on the 6th day of treatment. Scale bar: 100 μm.



**Figure S9.** Quantification of collagen fiber deposition in the three treatment groups on the 6th and 11th day based on the Masson staining.



**Figure S10.** Histological toxicological observation of H&E staining of tissues of major organs (heart, liver, spleen, lung, and kidney; scale bar = 100 µm).