Supporting information for

Integrated SERS platform for reliable detection and photothermal elimination of bacteria in whole blood samples

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Supplementary Figures

Figure S1 Average gap size and width of the as-prepared pAu.

Figure S2 AFM images of the prepared pAu from the top view (A) and side view (B).
**Figure S3** UV-vis absorbance of pAu.

**Figure S4** Average hydrodynamic diameters (A) of Au NPs, Au@PB NPs, Au@PB@Van NPs and ζ-potential values (B) of Au NPs, Au@PB NPs, vancomycin and Au@PB@Van NPs. The successful union between vancomycin and Au@PB NPs was confirmed by the increase in the hydrodynamic diameter from 83.6 ± 5.3 nm (Au@PB NPs) to 119.3 ± 10.1 nm (Au@PB@Van NPs). In addition, the ζ-potential values revealed that the presence of vancomycin made the surface charge of the Au@PB@Van NPs more positive than that of their Au@PB NPs counterparts; this was most likely due to the positive charge carried by vancomycin.
Figure S5 UV-vis absorbance of Au NPs (red line), Au@PB NPs (blue line) and Au@PB@Van NPs (green line). The spectra indicate that the characteristic absorption peak of Au NPs is about 524 nm (red line), and that of the PB shell is about 711 nm (blue line). After the modification of vancomycin, the absorbance of the PB shell (723 nm, green line) has a slightly red-shift, suggesting the successfully fabrication of Au@PB@Van NPs to some extent.

Figure S6 The SERS spectra of the SAM/pAu substrate in the silent region collected from 3 random area (A-C), and the Raman intensity distributions of MBN with the characteristic Raman peaks at 2223 cm\(^{-1}\) from all the mapping points (D). Each mapping area is 20 × 20 µm, in which 100 spectral lines were collected (excitation wavelength = 633 nm, acquisition time = 0.5 s).
Figure S7 (A–E) Distributions of the relative Raman intensities of the mapping points at 2150 cm\(^{-1}\) for five reproducible tests of \(S.\ aureus\). (F) Variations in the mapping points over the threshold line (%) at 2150 cm\(^{-1}\) for five reproducible tests of \(S.\ aureus\). \(S.\ aureus\) concentration: \(10^5\) CFU mL\(^{-1}\).

Figure S8 Mapping points over the threshold line (%) at 2150 cm\(^{-1}\) for the samples containing only \(E.\ coli\) (\(10^5\) CFU mL\(^{-1}\)), only \(S.\ aureus\) (\(10^5\) CFU mL\(^{-1}\)), and both \(E.\ coli\) and \(S.\ aureus\) (each at \(10^5\) CFU mL\(^{-1}\)).
Figure S9  SEM images of *B. subtilis* (A) and *S. typhimurium* (B) after being labelled with Au@PB@Van NPs.

Figure S10  Distributions of relative Raman signal intensities at 2150 cm$^{-1}$ from 900 mapping points for different concentrations of *B. subtilis* (A-F) and *S. typhimurium* (G). Inset in (A): the schematic diagram of mapping area with a step size of 30 µm. (H) Calibration curve between the concentrations of *B. subtilis* and the mapping points over the threshold line (%).
Figure S11 Distributions of relative Raman signal intensities at 2150 cm$^{-1}$ from 900 mapping points for the blank (A) and *S. aureus*-spiked blood samples (B) using the developed SERS assay. The mapping area is 900 × 900 µm with a step size of 30 µm.

Figure S12 Live-dead fluorescence images before and after NIR treatment of *S. aureus* on pure glass slide (i), on glass slide with Au@PB@Van NPs labelling (ii), on pAu (iii), and on pAu with Au@PB@Van NPs labelling (iv), respectively.