Supporting Information

$NaGdF_4$:Nd@$NaGdF_4$ Core-Shell Down-Conversion Nanoparticles as NIR-II Fluorescent Probes for Targeted Imaging of Bacteria

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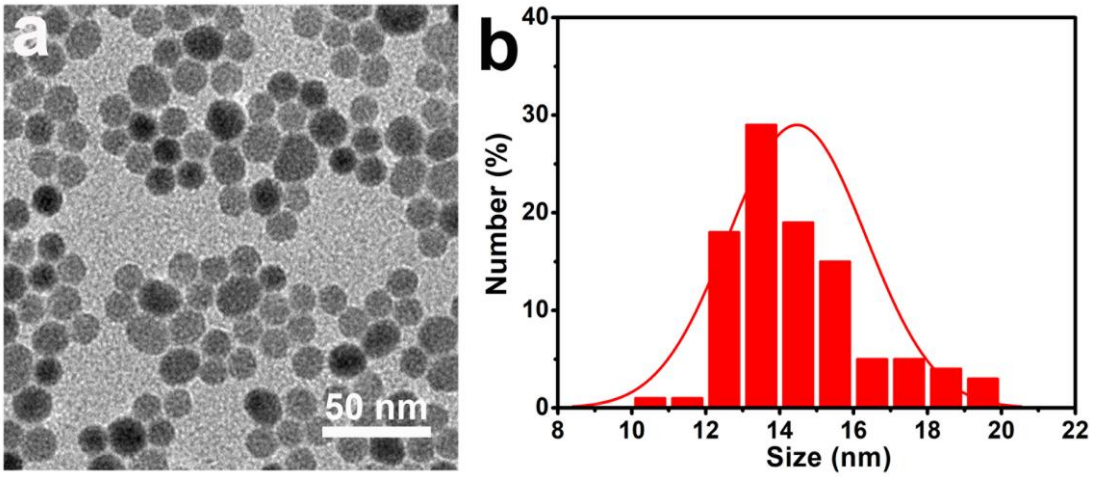

Figure S1. (a) TEM image of $NaGdF_4$:5%Nd core NPs. (b) Size distribution of $NaGdF_4$:5%Nd core NPs obtained by Gaussian fitting of particle size statistical software.

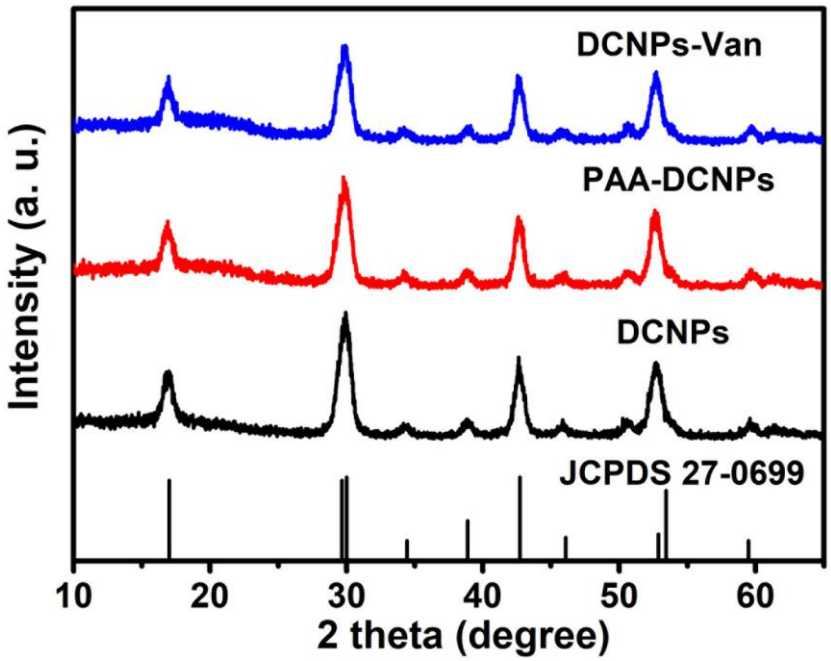

Figure S2. X-ray diffraction patterns of OA-capped DCNPs, PAA-DCNPs, and DCNPs-Van.

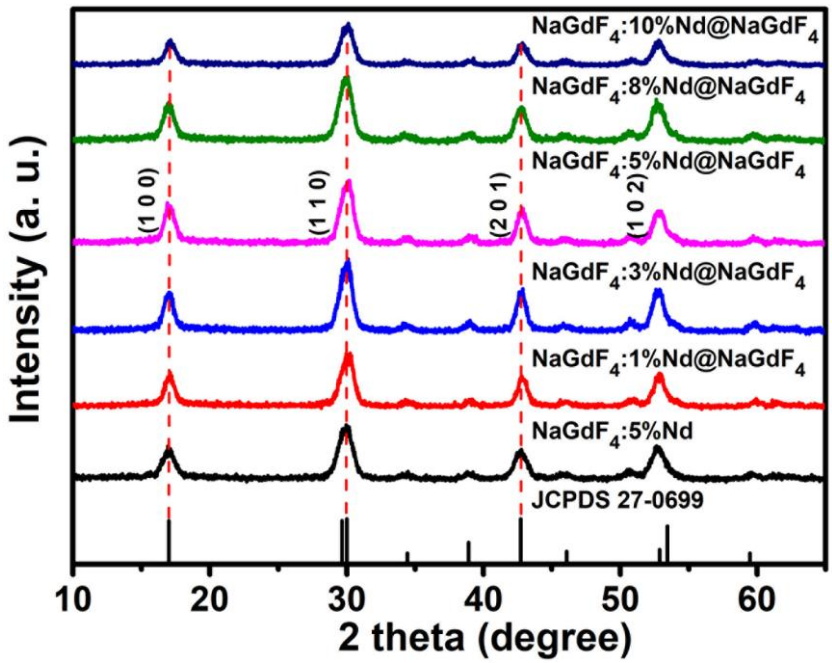

Figure S3. X-ray diffraction patterns of $NaGdF_4$:5%Nd and $NaGdF_4$:xNd@$NaGdF_4$ (x = 1, 3, 5, 8, 10%) NPs.

Table S1. Refined structural parameters of $NaGdF_4$:xNd@$NaGdF_4$ (x = 0, 5, 10%) NPs.

Space group	x = 0%	x = 5%	x = 10%
	$P6_3/m$	$P6_3/m$	$P6_3/m$
a (Å)	6.020	6.048	6.055
b (Å)	6.020	6.048	6.055
c (Å)	3.601	3.612	3.615
V ($Å^3$)	113.018	114.420	114.780
χ^2		3.571	2.731
R_{wp} (%)		8.982	8.244
R_p (%)		6.889	6.389

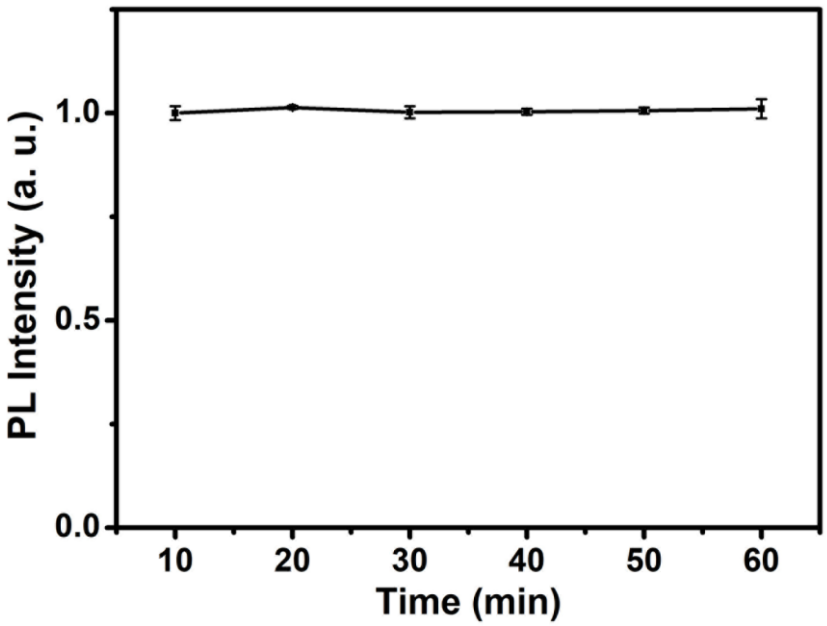

Figure S4. Luminescence intensity of DCNPs-Van as a function of irradiation time upon 808 nm excitation (300 mW/cm^2).

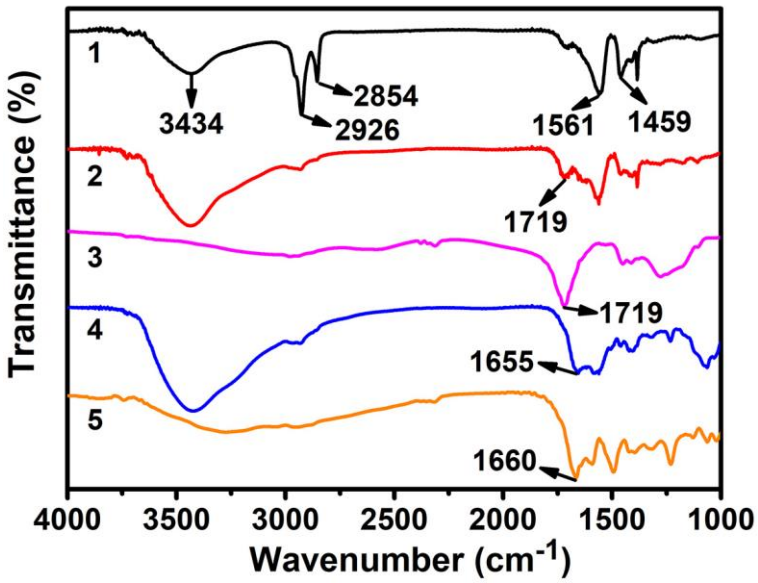

Figure S5. FTIR spectra of (1) OA-DCNPs, (2) PAA-DCNPs, (3) PAA, (4) DCNPs-Van, and (5) Van.

Compared with OA-DCNPs, the absorption bands around 2926 and 2854 cm^{-1} corresponding to C-H stretching vibrations decrease and the O-H stretching band around 3434 cm^{-1} increases in PAA-DCNPs and DCNPs-Van. Since OA on the surface of DCNPs is replaced by PAA, the characteristic vibration band of C=O at ~1719 cm^{-1} increases in PAA-DCNPs. After covalent coupling with vancomycin, the absorption bands of functional groups of vancomycin appears in DCNPs-Van.

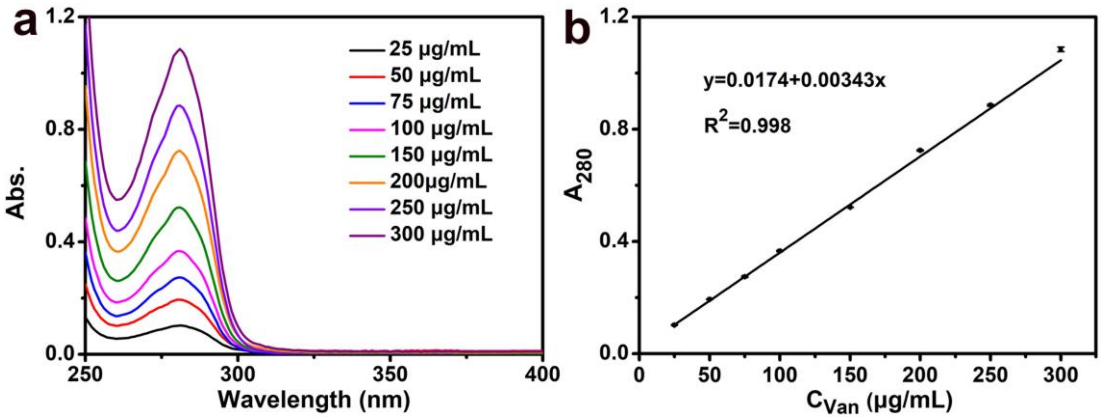

Figure S6. Quantification of vancomycin. (a) UV-Vis absorbance spectra of concentration-dependent vancomycin and (b) corresponding calibration curve.

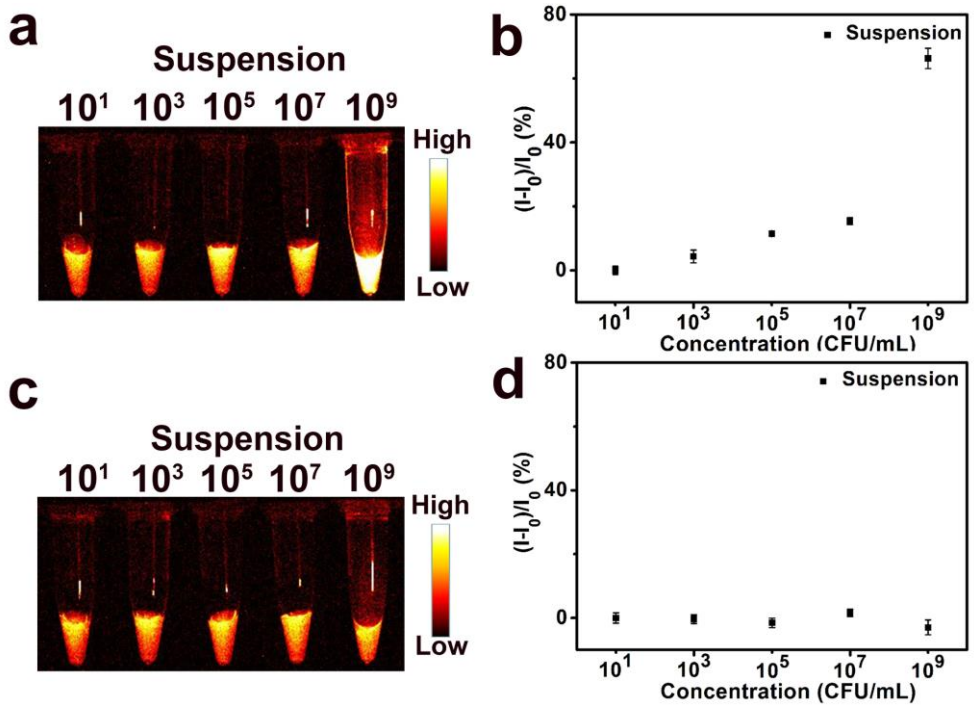

Figure S7. NIR-II images of (a) 10^7 CFU/mL *E. coli* + different concentrations of *S. aureus* suspensions, and (c) 10^7 CFU/mL *S. aureus* + different concentrations of *E. coli* suspensions upon 808 nm excitation (300 mW/cm^2); luminescence response of (b) 10^7 CFU/mL *E. coli* + different concentrations of *S. aureus* suspensions, and (d) 10^7 CFU/mL *S. aureus* + different concentrations of *E. coli* suspensions.

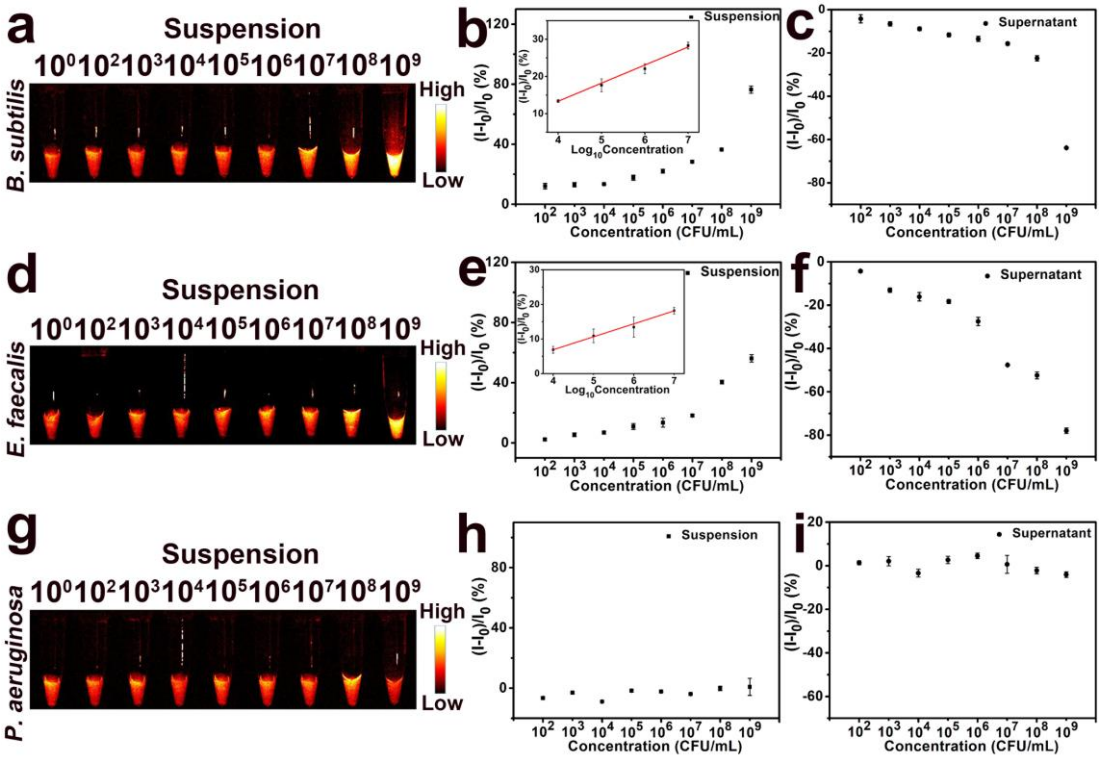

Figure S8. NIR-II images of (a) *B. subtilis* suspensions, (d) *E. faecalis* suspensions and (g) *P. aeruginosa* suspensions upon 808 nm excitation (300 mW/cm^2); luminescence response of (b) *B. subtilis* suspensions, (c) *B. subtilis* original supernatants, (e) *E. faecalis* suspensions, (f) *E. faecalis* original supernatants, (h) *P. aeruginosa* suspensions, and (i) *P. aeruginosa* original supernatants at different bacterial concentrations. The insets of (b) and (e) show a linear relationship between the luminescence response and the logarithm of bacterial concentrations from 10^4 to 10^7 CFU/mL.

Fig. S8b (inset) shows a linear relationship between the luminescence response and the logarithm of the concentration of *B. subtilis* suspensions in the concentrations range from 10^4 to 10^7 CFU/mL with a slope of 4.86 and a correlation coefficient of 0.995; Fig. S8e (inset) shows a linear relationship between the luminescence response and the logarithm of the concentration of *E. faecalis* suspensions, 10^4 to 10^7 CFU/mL, with a slope of 3.74 and a correlation coefficient of 0.997.

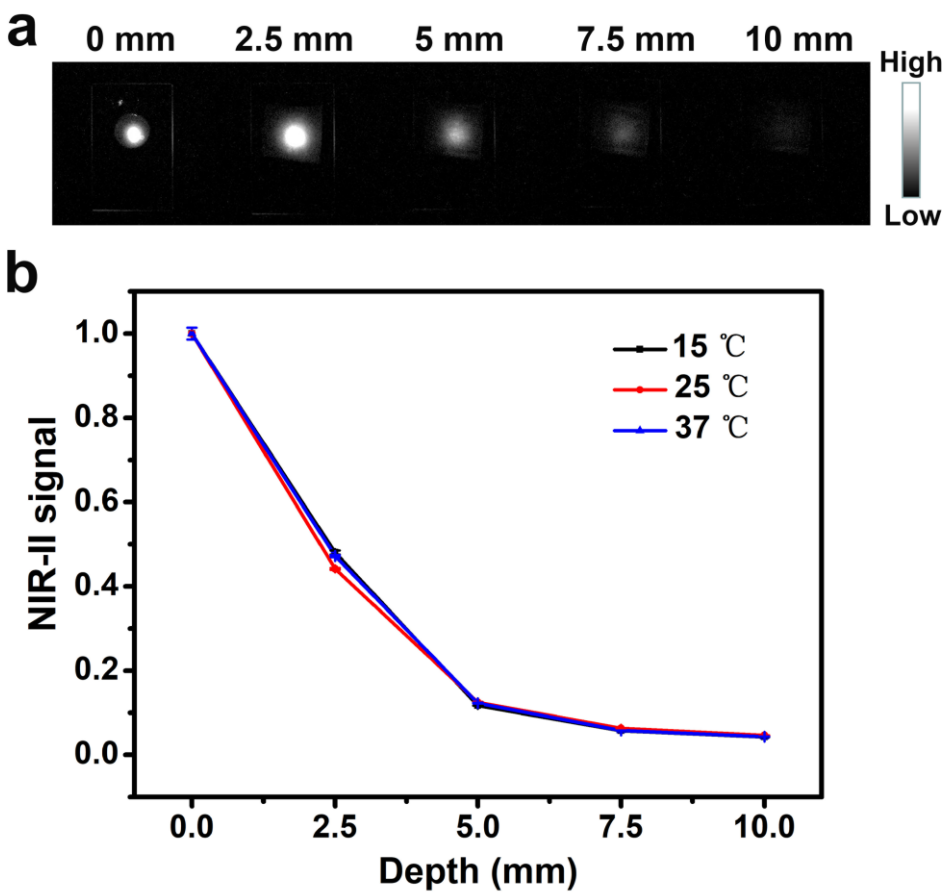

Figure S9. (a) NIR-II images of DCNPs-Van covered by pork muscle tissues with various thicknesses upon 808 nm excitation (300 mW/cm^2). (b) NIR-II signal intensity from DCNPs-Van covered by tissues with different temperatures as a function of different depths.

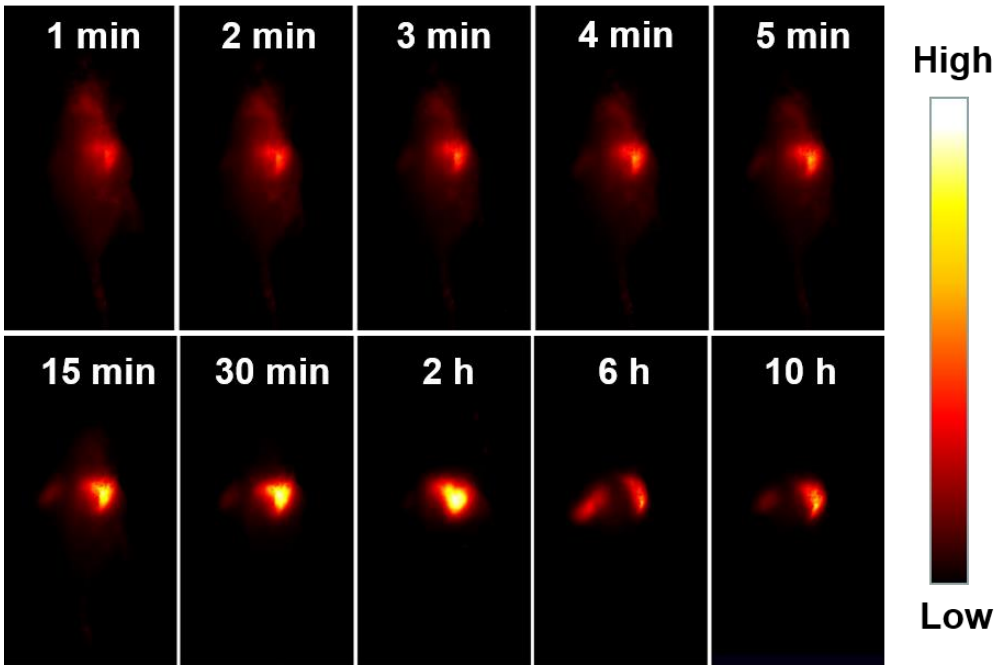

Figure S10. NIR-II imaging of healthy mice after intravenous injection of DCNPs-Van at different time intervals upon 808 nm excitation (300 mW/cm^2).