Electronic Supplementary Information

Bacteria-derived fluorescent carbon dots for microbial live/dead differentiation

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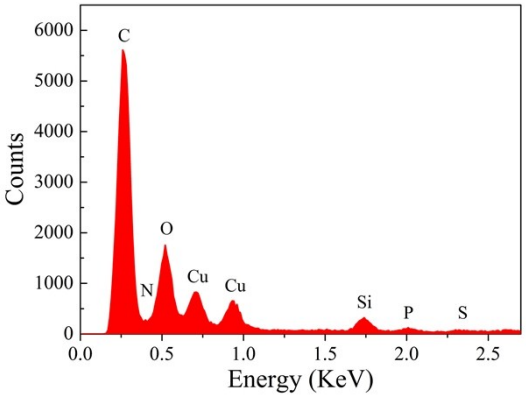

Fig. S1 The EDS result of CDs-*S. aureus*.

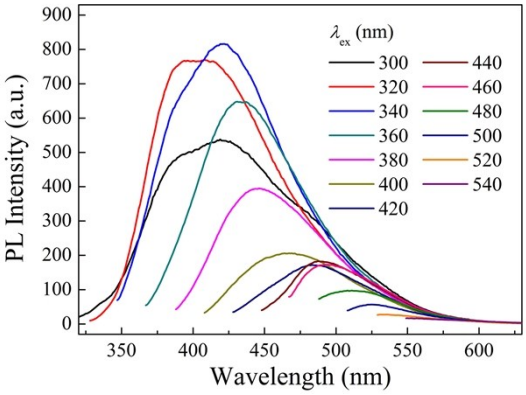

Fig. S2 Fluorescence emission spectra of CDs-*S. aureus* dispersed in cell PBS solution excited at different wavelengths from 300 to 540 nm with an increment of 20 nm.

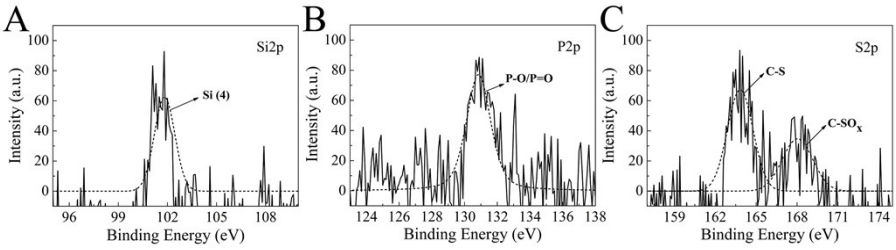

Fig. S3 The high-resolution XPS peaks of (A) Si2p, (B) P2p and (C) S2p, respectively.

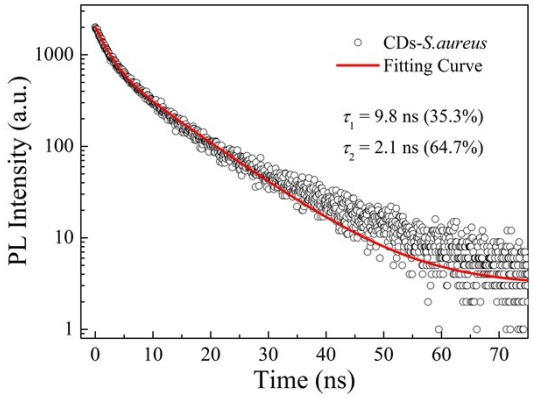

Fig. S4 The fluorescence decay curve of CDs-*S. aureus*.

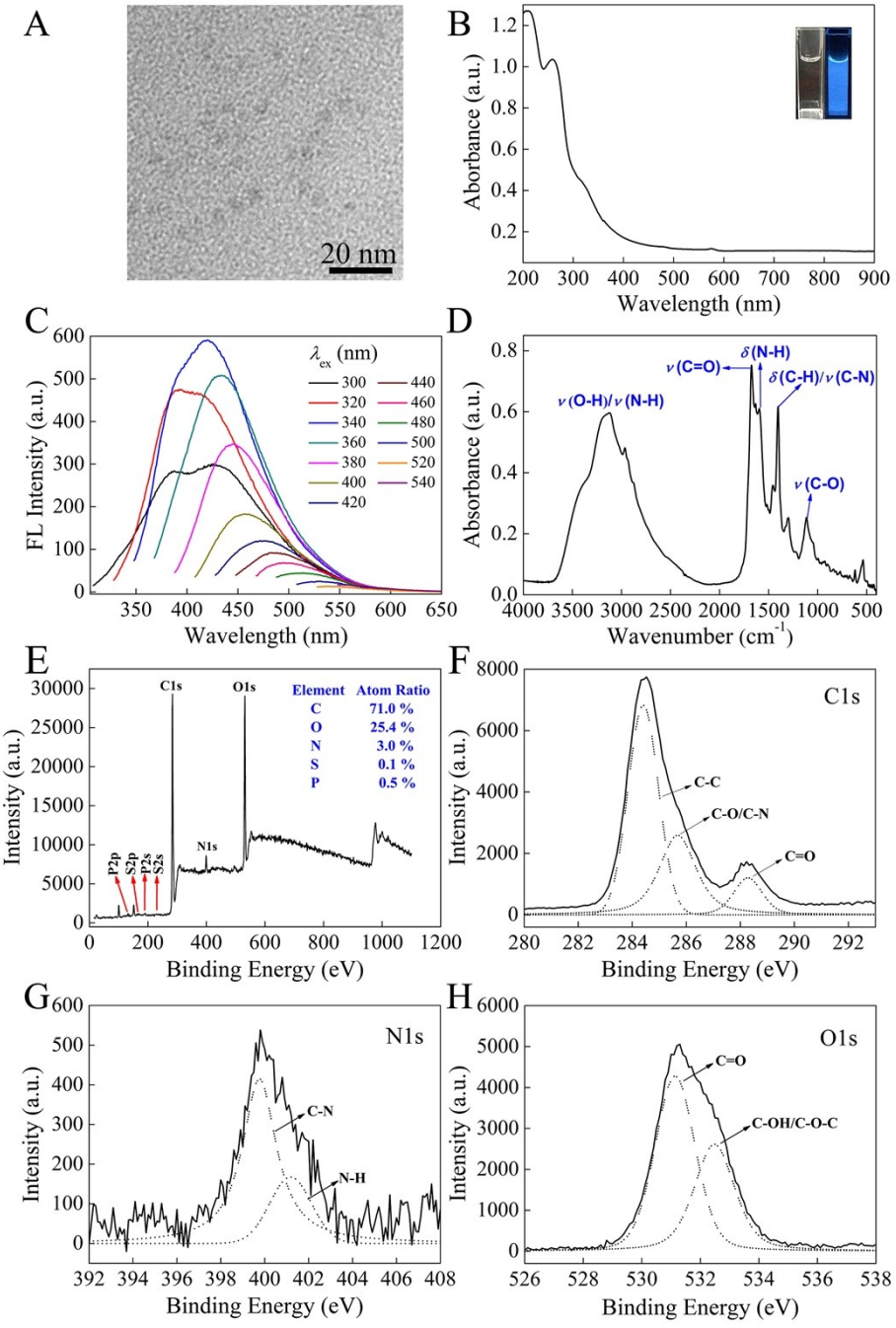

Fig. S5 Characterizations of CDs-*E. coli*. (A) TEM image of CDs-*E. coli*. (B) UV–vis spectrum of CDs-*E. coli*. Inset shows the CDs irradiated under white light (left) and UV (365 nm) light (right). (C) Fluorescence emission spectra of CDs-*E. coli* excited at different wavelengths from 300 to 540 nm with an increment of 20 nm. (D) FTIR spectrum of CDs-*E. coli*. (E) XPS spectrum of dried CDs-*E. coli*. (F–H) The high-resolution XPS peaks of C1s, N1s and O1s, respectively.

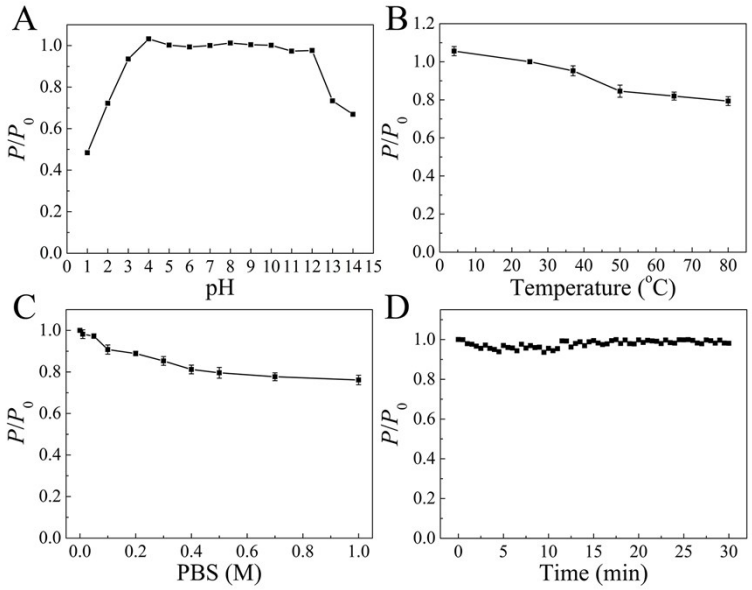

Fig. S6 PL properties of CDs-*S. aureus* as a function of (A) pH, (B) temperature, (C) ionic strength (different concentrations of PBS solution, pH = 7.4) and UV irradiation time. The PL intensity (P) was measured at 416 nm (λ_{ex} = 332 nm). P_0 is the PL intensity of CD solution in the control group (pure water, pH =7, 25 °C, without laser irradiation).

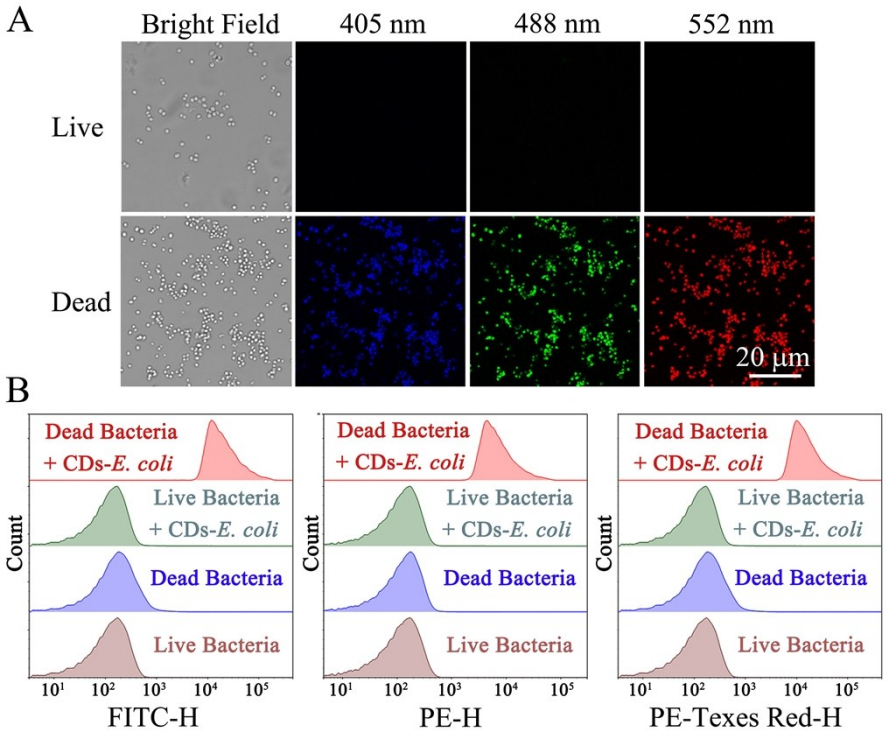

Fig. S7 The confocal fluorescence images (A) and flow cytometric analyses (B) of live and dead *S. aureus* stained with CDs-*E. coli* for 1 h. Fluorescence images were captured under the excitation of 405, 488 and 552 nm, respectively. Flow cytometric analyses were conducted using three channels of FITC, PE and PE-Texes Red.

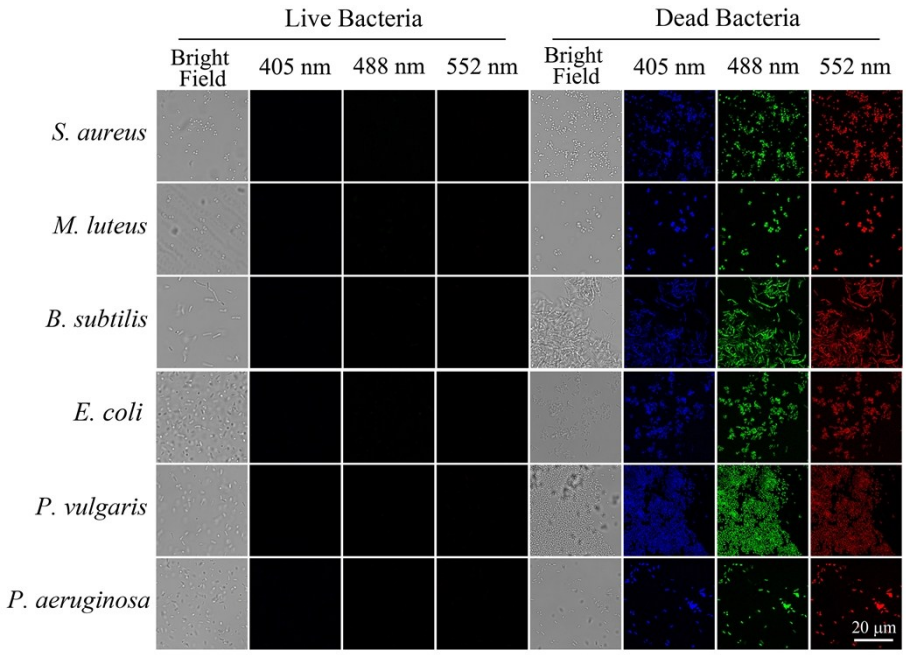

Fig. S8 Bright field and fluorescence images of live/dead bacteria including two other Gram-

positive bacteria (*M. luteus* and *B. subtilis*) and three Gram-negative bacteria (*E. coli*, *P. vulgaris* and *P. aeruginosa*) stained with CDs-*E. coli*. Fluorescence images were captured upon excitation at 405, 488 and 552 nm, respectively.

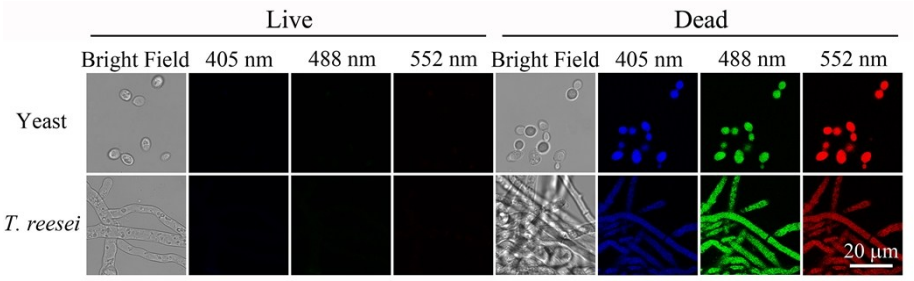

Fig. S9 Bright field and fluorescence images of live and dead fungal cells (yeast and *T. reesei*) stained with CDs-*E. coli.* Fluorescence images were captured upon excitation at 405, 488 and 552 nm, respectively.

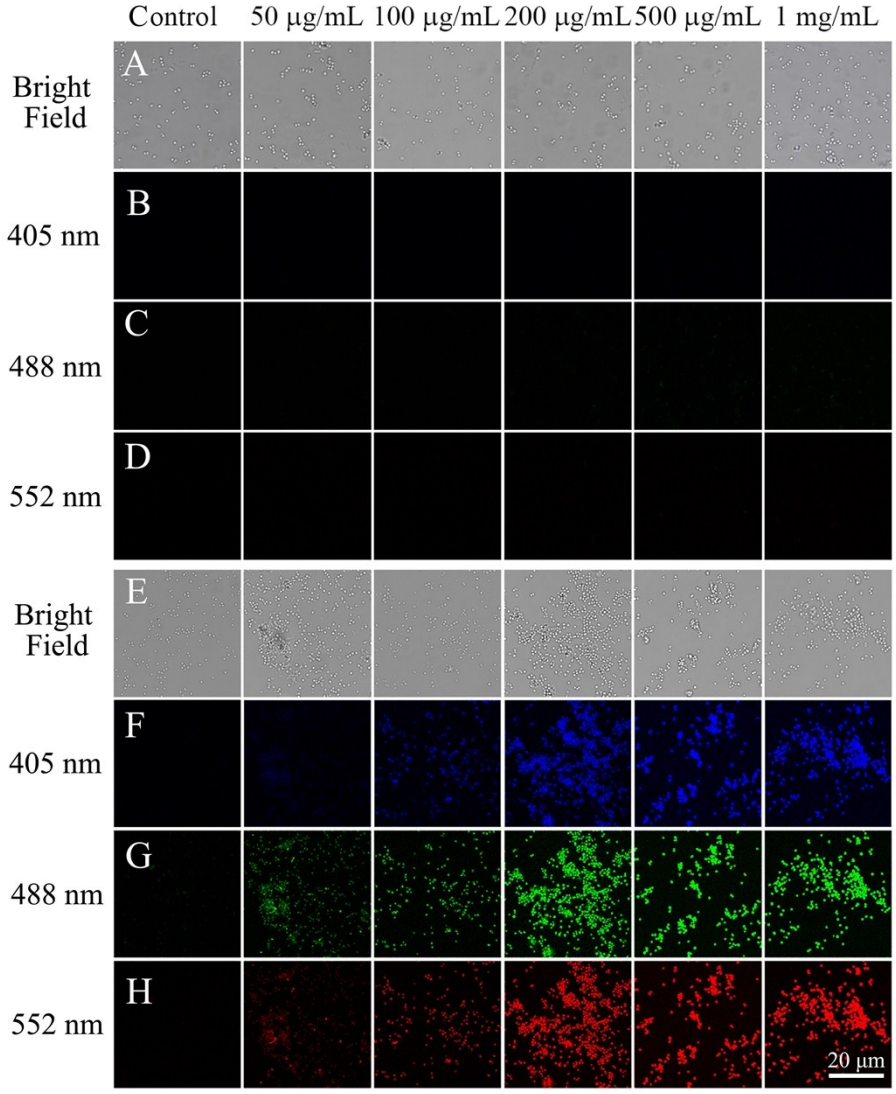

Fig. S10 Bright and fluorescence images of live and dead *S. aureus* cells stained with CDs-*S. aureus* at various concentrations. Fluorescence images were captured upon excitation at 405, 488 and 552 nm, respectively.

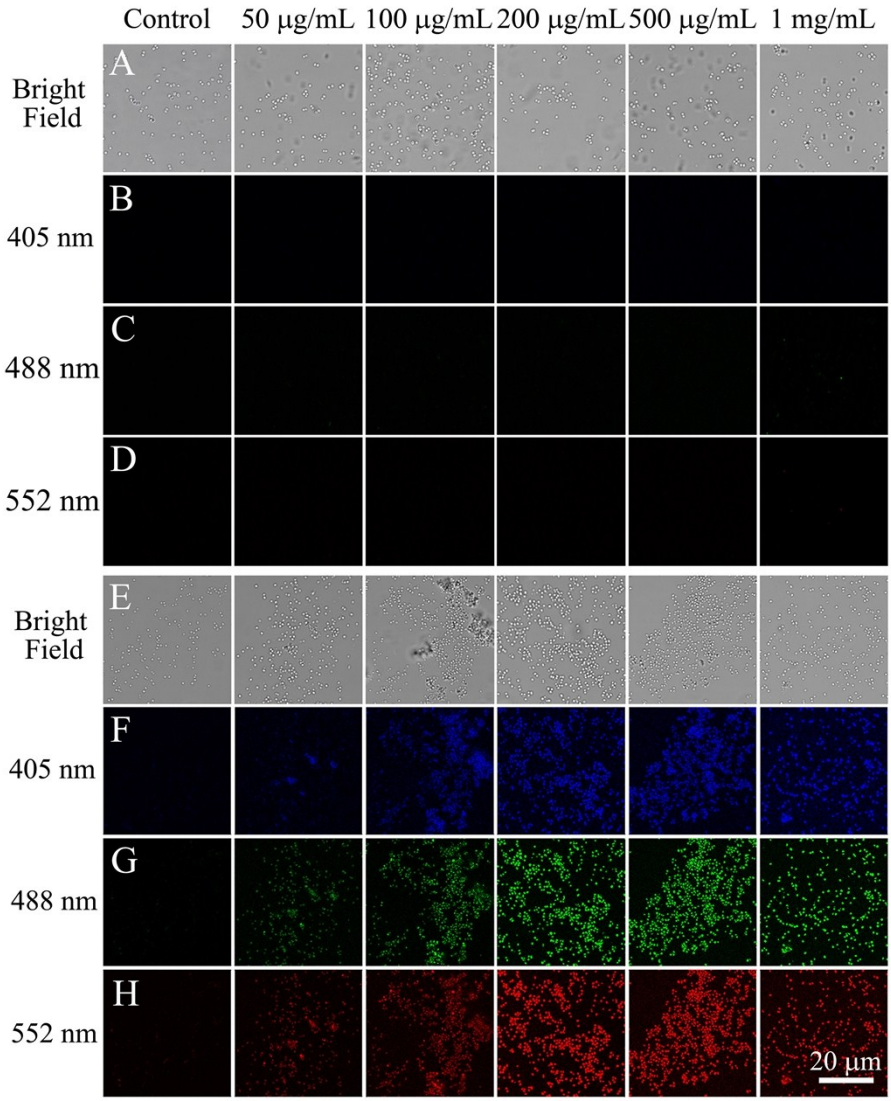

Fig. S11 Bright and fluorescence images of live and dead *S. aureus* cells stained with CDs-*E. coli* at various concentrations. Fluorescence images were captured upon excitation at 405, 488 and 552 nm, respectively.

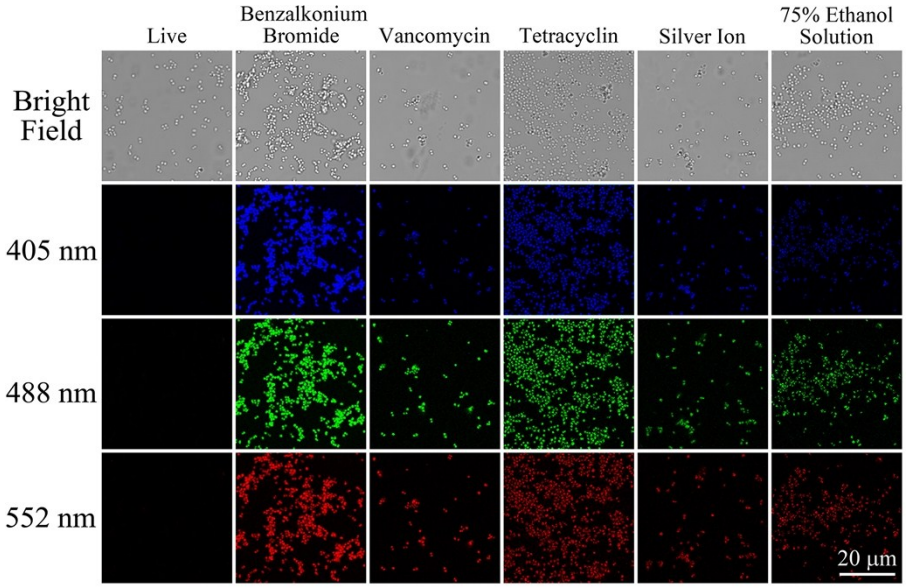

Fig. S12 Bright field and fluorescence images of CDs-*E. coli* (200 μg/mL)-stained live *S. aureus* and dead *S. aureus* that were killed in different ways. Fluorescence images were captured upon excitation at 405, 488 and 552 nm, respectively.

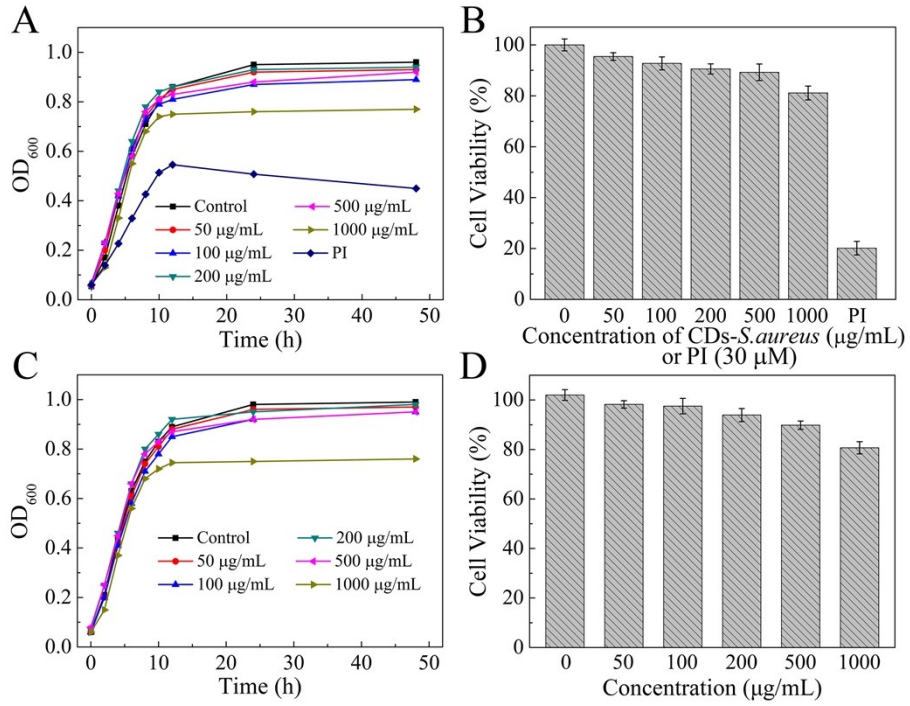

Fig. S13 (A) Real-time cell growth monitoring of *S. aureus* bacteria and (B) colony unit forming counting assay for yeast cells (incubated with 30 μM PI or different concentrations of CDs-*S. aureus*). (C) Real-time cell growth monitoring of *S. aureus* bacteria and (D) colony unit forming counting assay for yeast cells (incubated with different concentrations of CDs-*E. coli*).

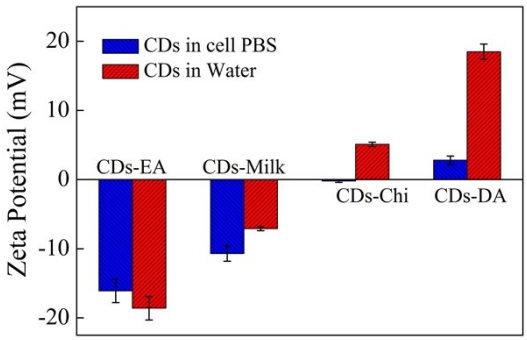

Fig. S14 The zeta potential values of four types of CDs dissolved in cell PBS solution and pure water.