Supporting Information

Layer-By-Layer Decorated Nanoparticles with Tunable Antibacterial and Antibiofilm Properties against Both Gram-Positive and Gram-Negative Bacteria

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LbL coating of NPs with FITC-labeled AC

10 mg/mL solution of AC was prepared in sodium carbonate buffer pH 9. Fluorescein isothiocyanate (FITC) was dissolved in anhydrous dimethyl sulfoxide at 1 mg/mL. For each 1 mL of AC solution, 50 μL of FITC solution were added slowly under stirring and then the reaction was incubated in dark for 8 h at 4 °C. The unreacted FITC was removed using PD-10 desalting columns (Sigma Aldrich). The LbL assembly of FITC labeled AC and HA was performed on the polymer NPs template. The coating of colloidal particles was confirmed using fluorescence microscope. The detected fluorescence is from the successful multilayered deposition of the cationic AC on the NPs' surface.

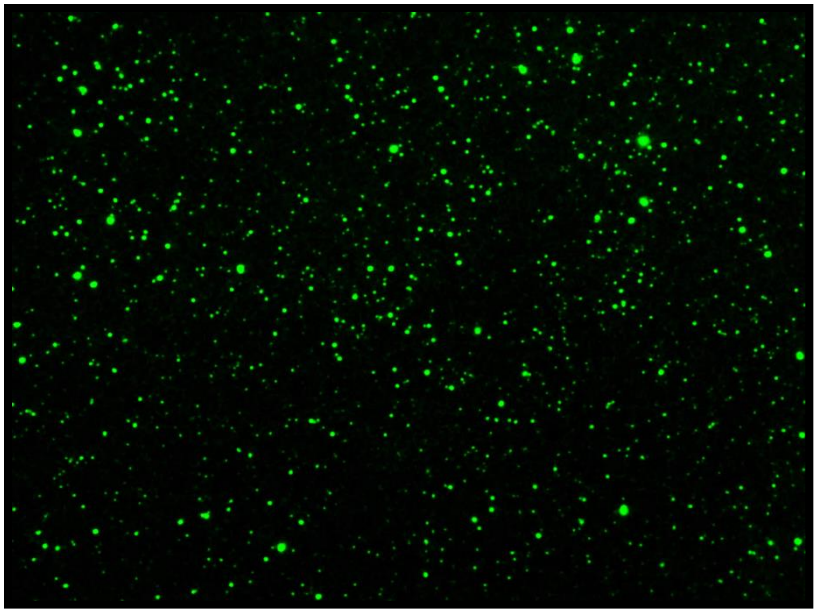

Figure S1. Microscopic image of FITC-labeled AC/HA multilayers deposited on the NPs' surface.

MIC of AC against *S. aureus* and *E. coli*

The antibacterial activity of the AC was assessed against *S. aureus* and *E. coli* (Figure S2). The OD measurements showed that 80 μg/mL of AC (3.5 μmol/mL amino groups) is the minimal concentration needed to eradicate both bacterial strains. The amino groups functionalities on the surface of the NPs (1.09 μmol/mL) and those present in the bulk AC solution (3.5 μmol/mL) were different and confirmed the synergy between the nano-form and amino groups.

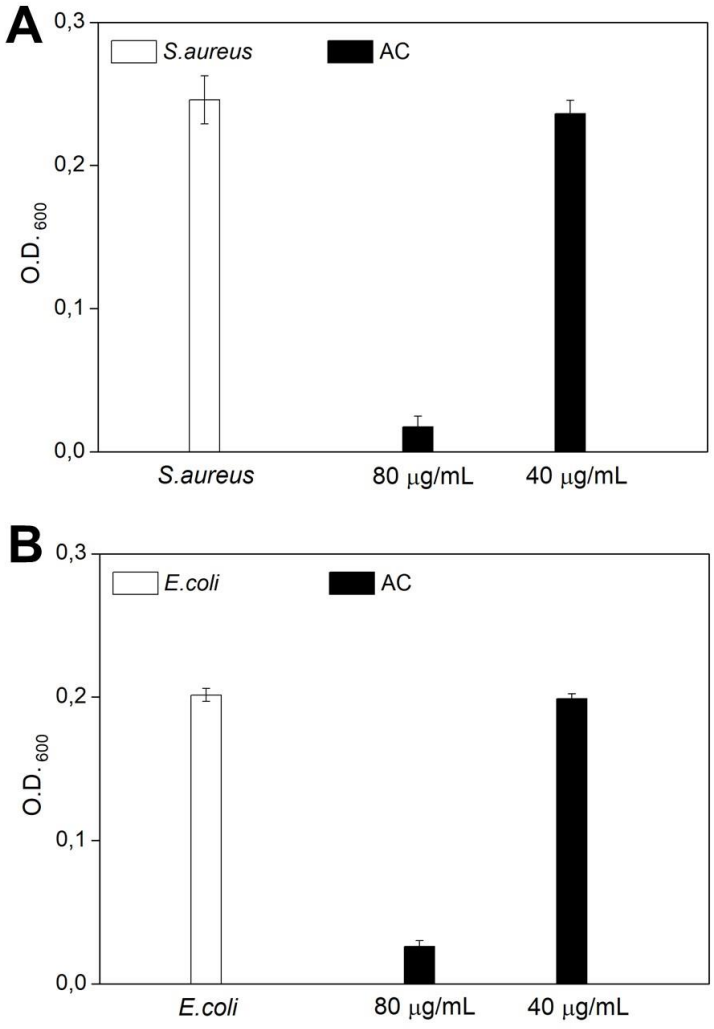

Figure S2. *S. aureus* and *E. coli* growth after 24 h incubation with different concentrations of AC.

Antibacterial activity of LbL NPs decorated with five layers of AC and HA

The polymer NP templates were initially functionalized with five layers of AC and HA and their antibacterial properties were assessed against Gram-positive *S. aureus*. The coated NPs did not affect the bacterial growth, which was due to the insufficient amount of AC in the multilayered shell (Figure S3). The development of efficient bactericidal system requires more available amino groups on the NPs surface and could be achieved with the deposition of more layers.

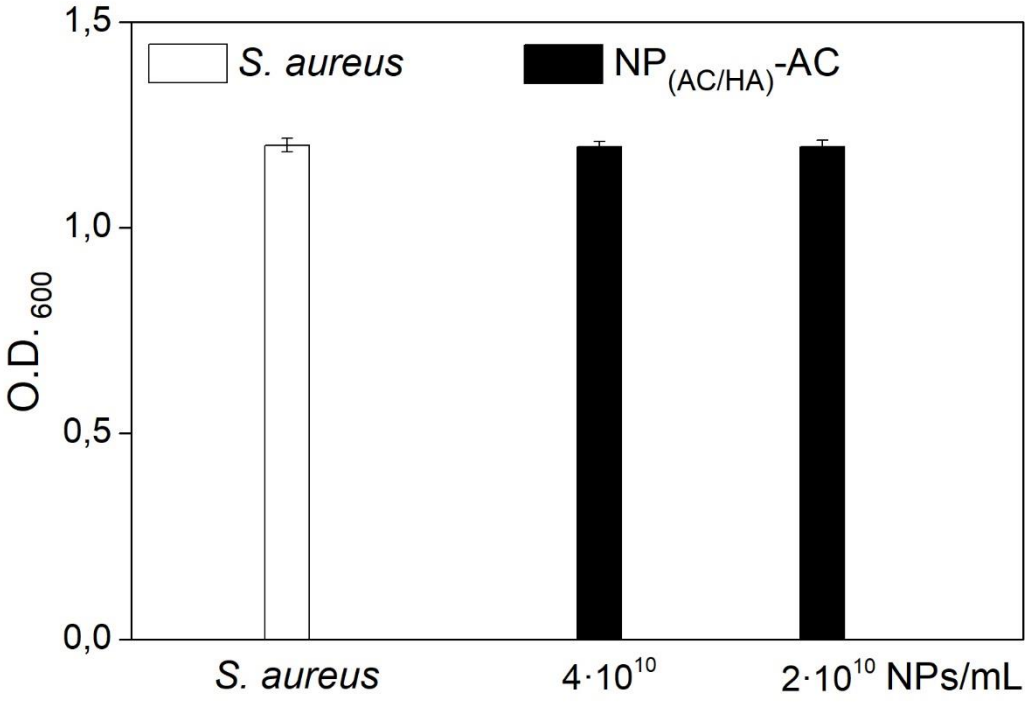

Figure S3. *S. aureus* growth after 24 h incubation with coated NPs.