FACILE SYNTHESIS OF ANTIBIOTIC-FUNCTIONALIZED GOLD NANOPARTICLES FOR COLORIMETRIC BACTERIAL DETECTION

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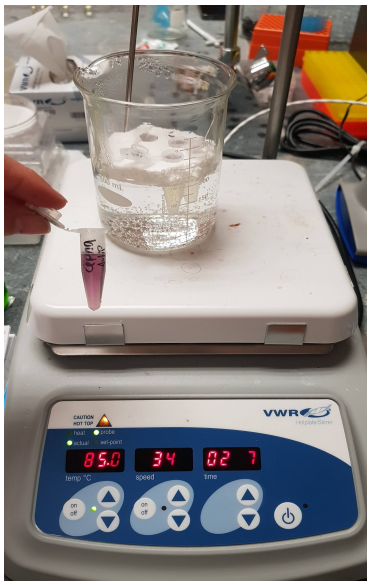

Figure S1. Experimental apparatus equipped with a mild temperature water bath for ATB@AuNP synthesis.

Figure S2. Colloidal solutions of penicillin functionalized AuNP synthesized using various concentrations of penicillin.

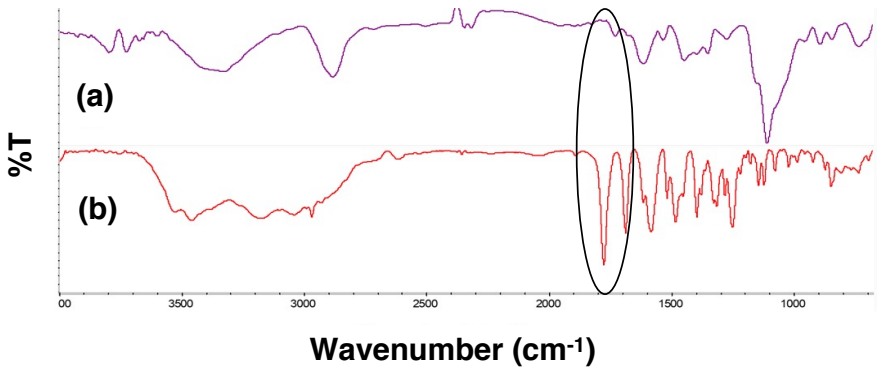

Figure S3. Representative FTIR spectra of (a) cepha@AuNP and (b) cepha ATB only. Note the disappearance of the characteristic amide frequency at 1690 cm^{-1} upon binding to the AuNP surface.

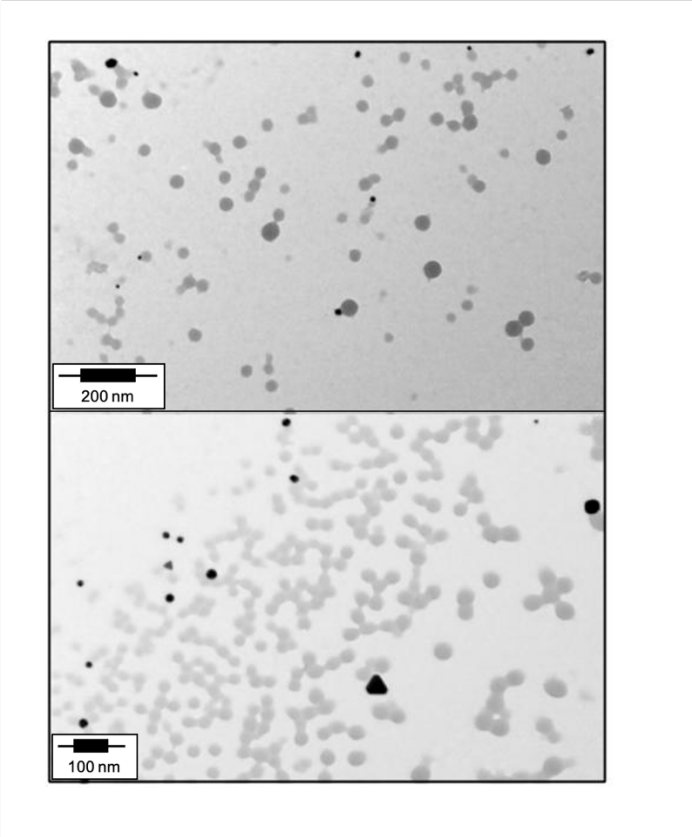

Figure S4. Nanoemulsion formation in baci@AuNP solutions. Note the aggregation of several nanodroplets with each other.

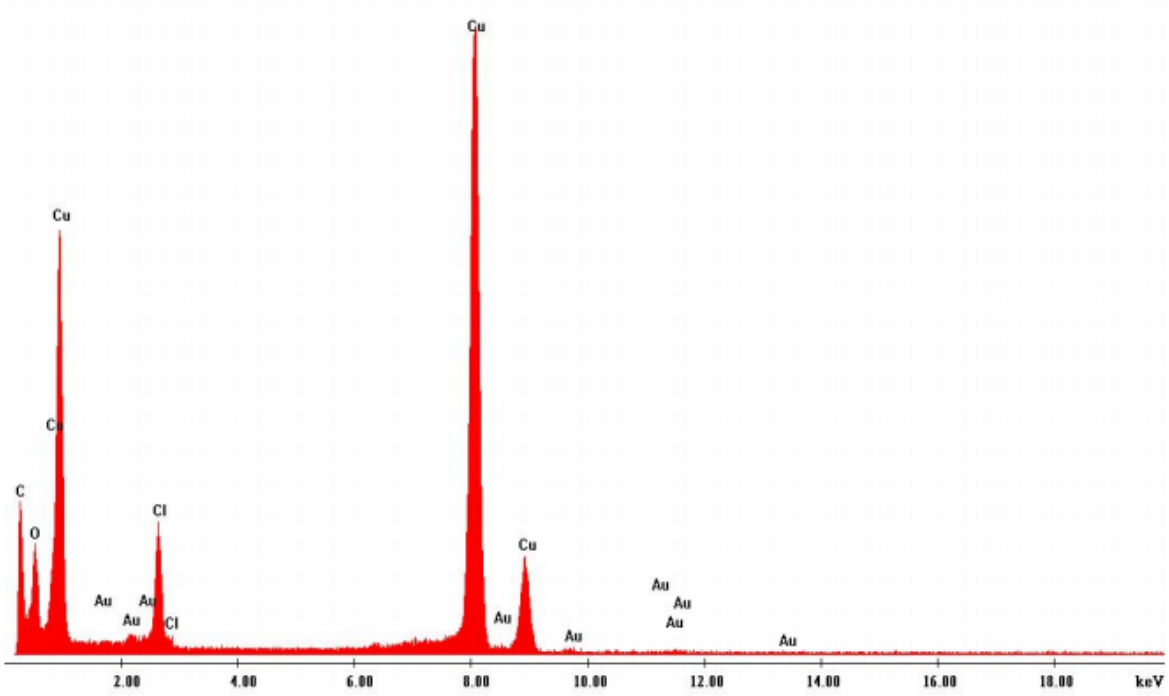

Figure S5. Energy dispersive X-Ray spectrum of the selected area following diffraction pattern analysis. Note the presence of elemental Au supporting identification as a AuNP species.

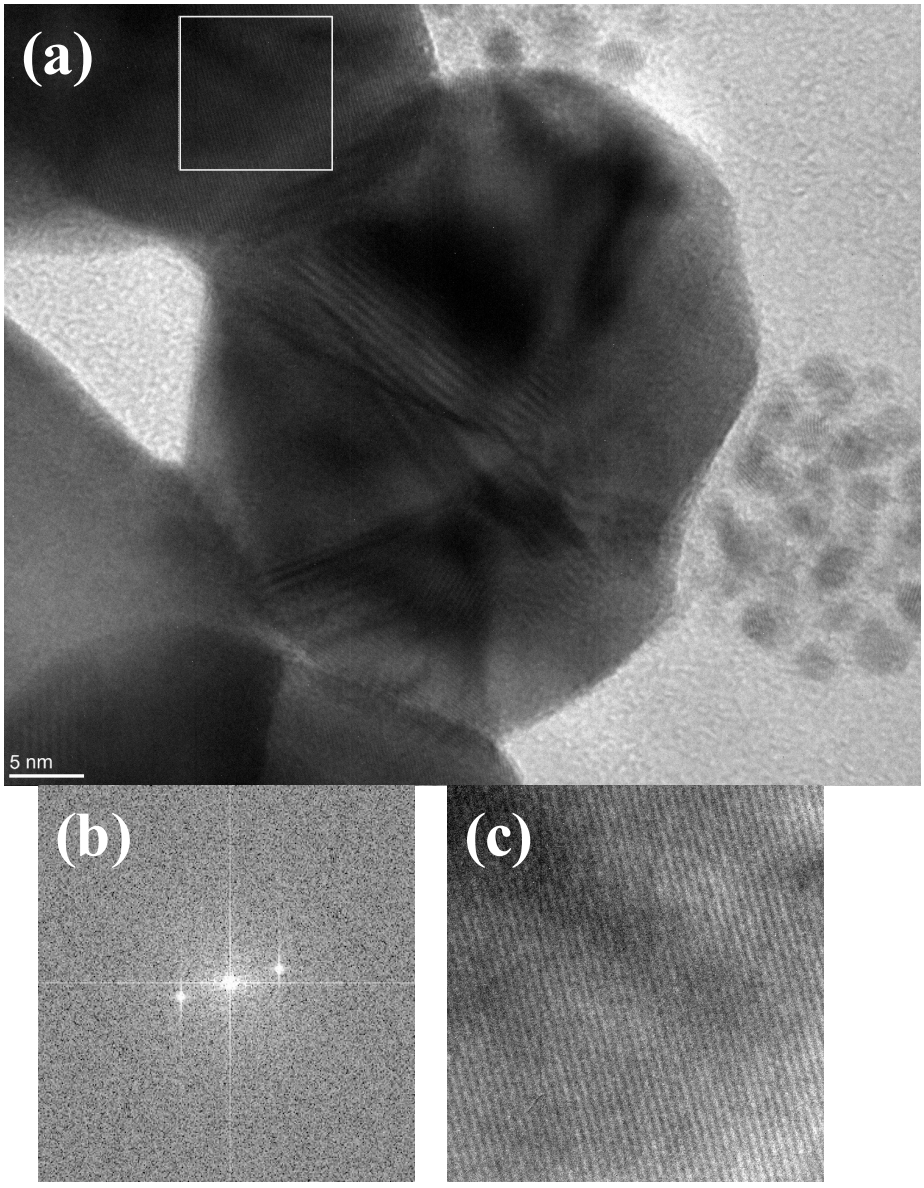

Figure S6. (a) HR-TEM, (b) FFT and (c) filtered inverse FFT for cepha@AuNP. Filtered inverse FFT clearly shows the lattice fringes supporting formation of crystalline Au nanospecies.

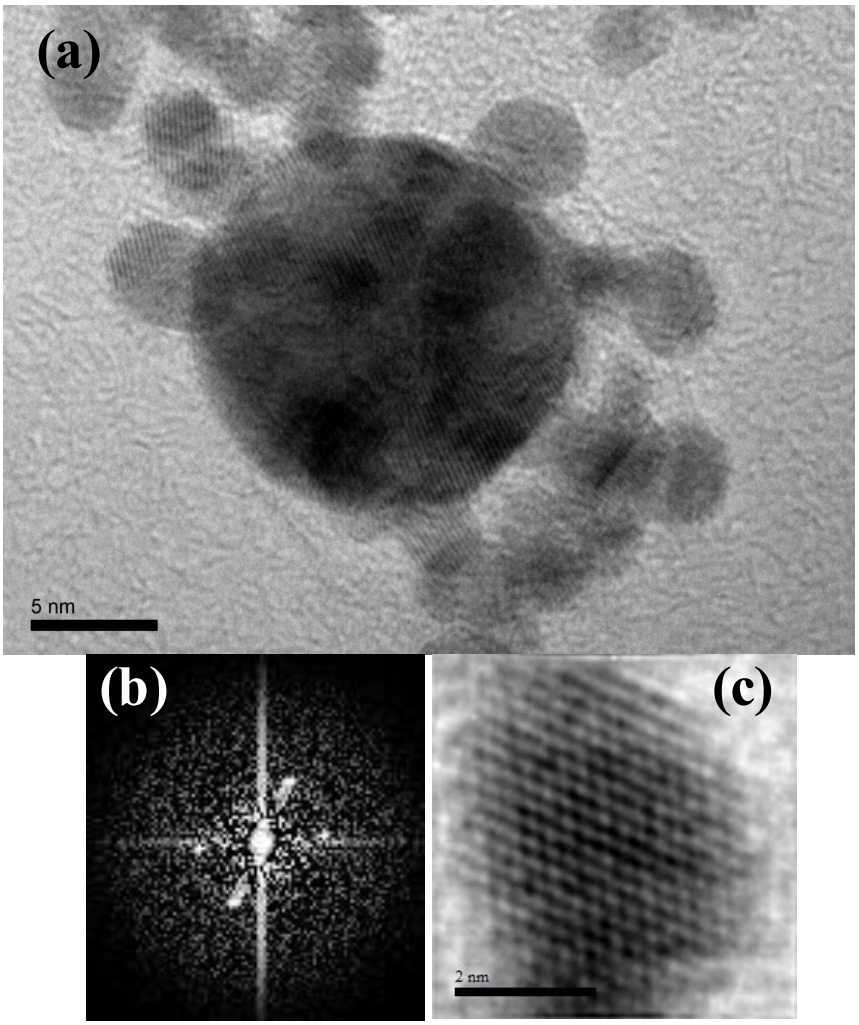

Figure S7. (a) HR-TEM, (b) FFT and (c) filtered inverse FFT for peni@AuNP. Filtered inverse FFT clearly shows the lattice fringes supporting formation of crystalline Au nanospecies.

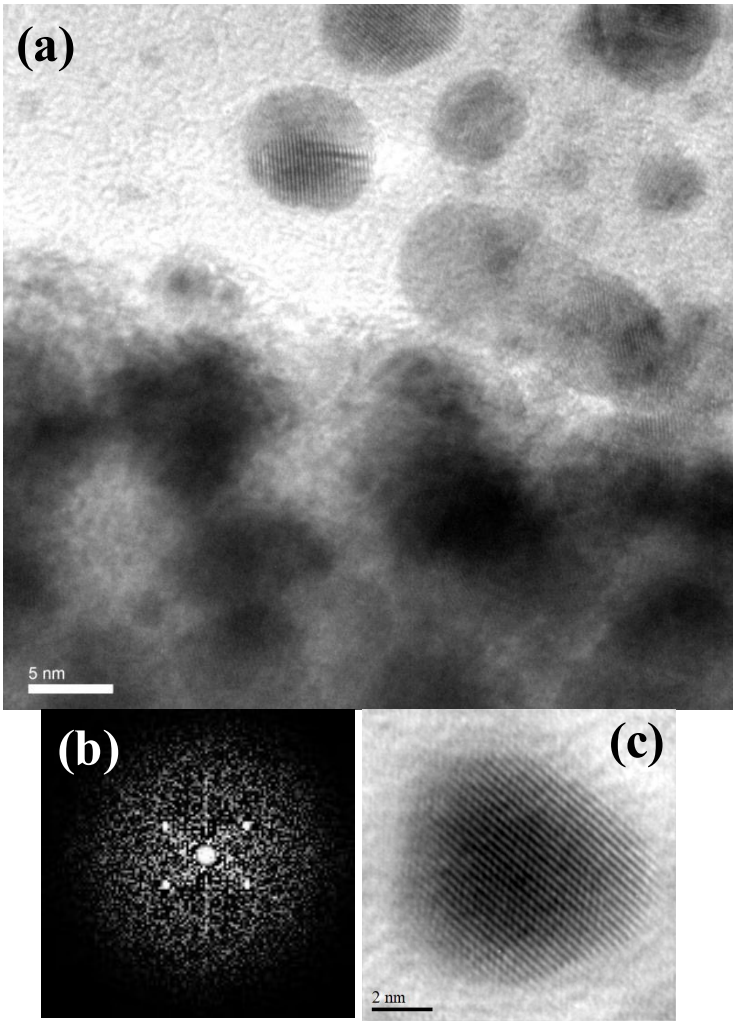

Figure S8. (a) HR-TEM, (b) FFT and (c) filtered inverse FFT for poly@AuNP. Filtered inverse FFT clearly shows the lattice fringes supporting formation of crystalline Au nanospecies.

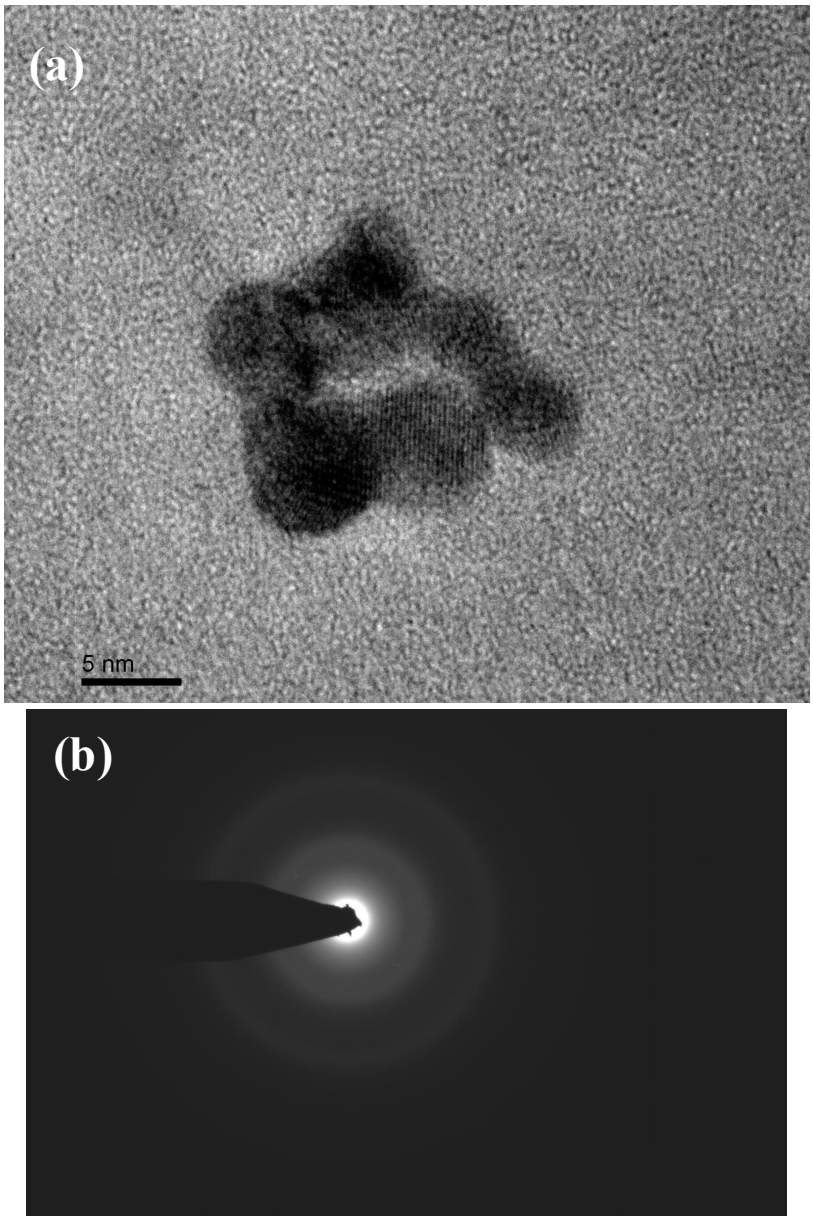

Figure S9. (a) HR-TEM and (b) diffraction ring patterning for baci@AuNP. Diffraction ring analysis confirms the Au nature of the nanospecies with the diffraction rings being representative of the Au (111) surface.

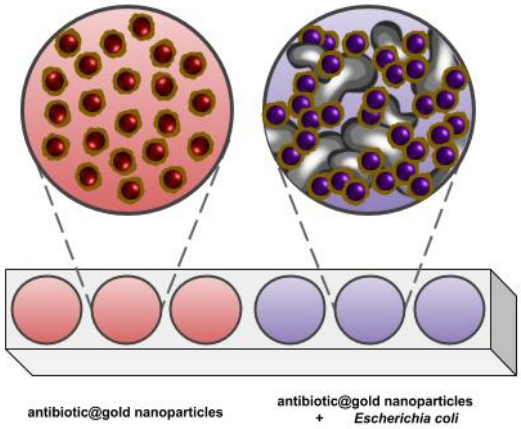

Figure S10. Illustration showcasing the expected mode of colorimetric bacterial detection.

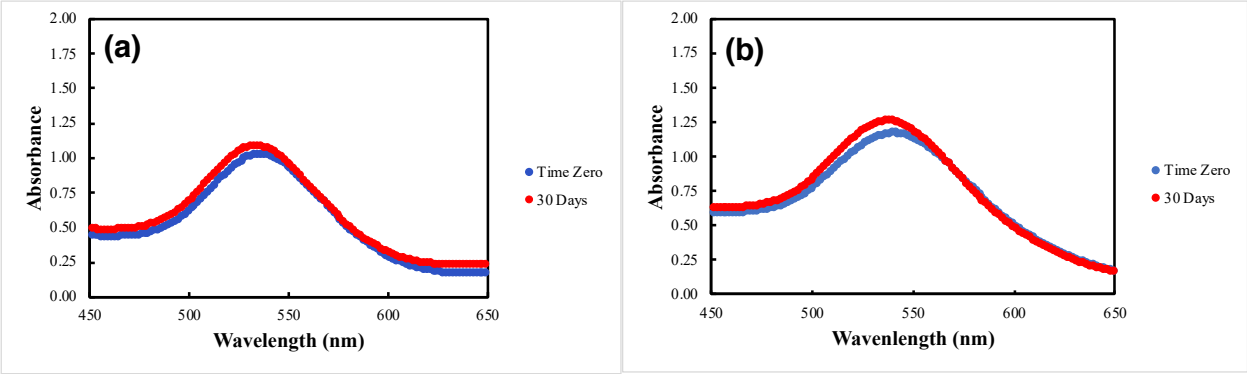

Figure S11. UV-visible spectra of (a) cepha@AuNP and (b) peni@AuNP monitored over a 30-day period to assess stability of the ATB@AuNP colloids.

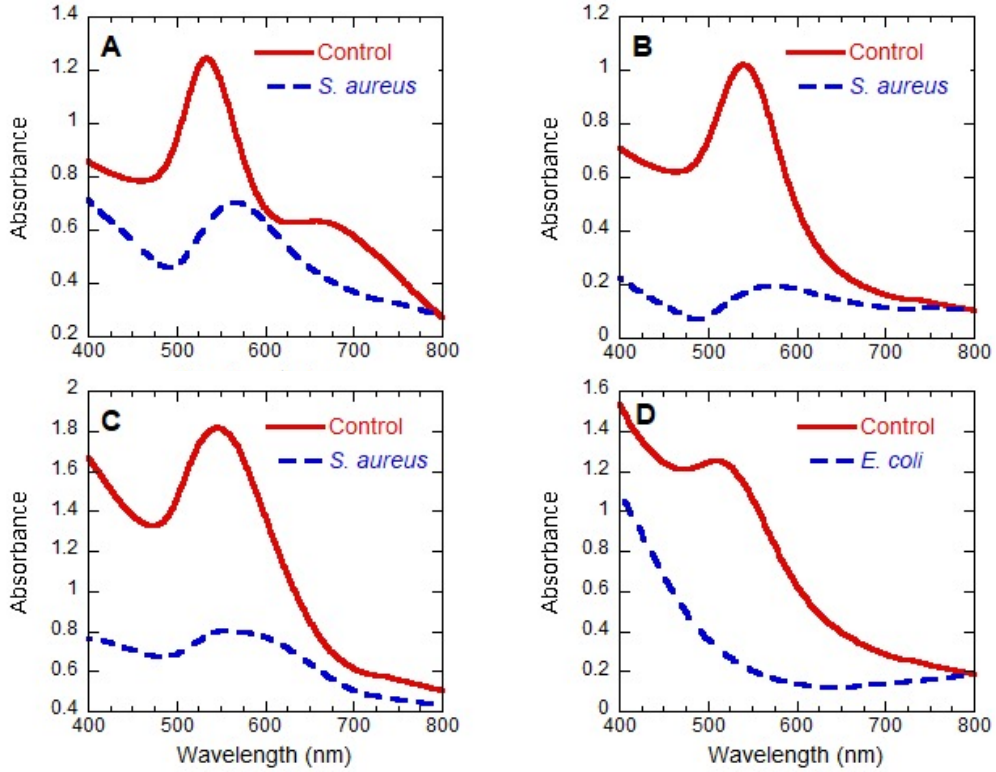

Figure S12. UV-visible spectra of (a) cepha@AuNP, (b) peni@AuNP and (c) baci@AuNP following addition of 10^2 CFU/mL of *S. aureus* and of (d) poly@AuNP following introduction of *E. coli*.

$$\text{mol } HAuCl_4 \bullet 3H_2O \times \frac{196.97 \frac{g}{mol} Au}{393.83 \frac{g}{mol} HAuCl_4 \bullet 3H_2O} \quad \textbf{(1)}$$

$$\text{mol } \cancel{HAuCl_4 \bullet 3H_2O} \times 0.5001 \frac{Au}{\cancel{HAuCl_4 \bullet 3H_2O}}$$

$$\therefore \textbf{ mol } \mathbf{HAuCl_4 \bullet 3H_2O} \times \mathbf{0.5001} = \textbf{mol Au}$$

$$r_{AuNP} = {}^{d_{AuNP}}/_{2} \quad \textbf{(2)}$$

$$N_{Au} = \left(\frac{r_{AuNP}}{0.144}\right)^3 \quad \textbf{(3)}$$

$$\textbf{[AuNP]} = \frac{\textbf{[Au]}}{\textbf{N}_{\textbf{Au}}} \quad \textbf{(4)}$$

Figure S13. Methodology used for the approximation of [AuNP].

The approximate [AuNP] were calculated using approximations of the number of gold atoms and the TEM imaging data. A brief description of the mathematical process is presented herein. First, the concentration of Au is calculated, in M ([Au]) from the known concentration of Au^{3+} salt. **Eq. 1** presents the equations required to convert mol of $HAuCl_4$ to Au. From here, the average radii (r_{AuNP}; nm) of the AuNP can be calculated using the average AuNP diameter measured from TEM images (d_{AuNP}; nm), **eq. 2**. Next, approximate the number of Au atoms (N_{Au}) comprising the nanoparticle structure (**eq. 3**), where 0.144 nm is the average atomic radius of Au. Finally, using **eq. 4,** estimate the approximate concentration of AuNP ([AuNP]; M) using N_{Au} and the approximate [Au] as calculated from eq. 1.