

Electronic Supplementary Information

Gold Nanoparticle Labeling Based ICP-MS Detection/Measurement of Bacteria, and Their Quantitative Photothermal Destruction

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Content

Raman Intensity at 1590 cm^{-1}

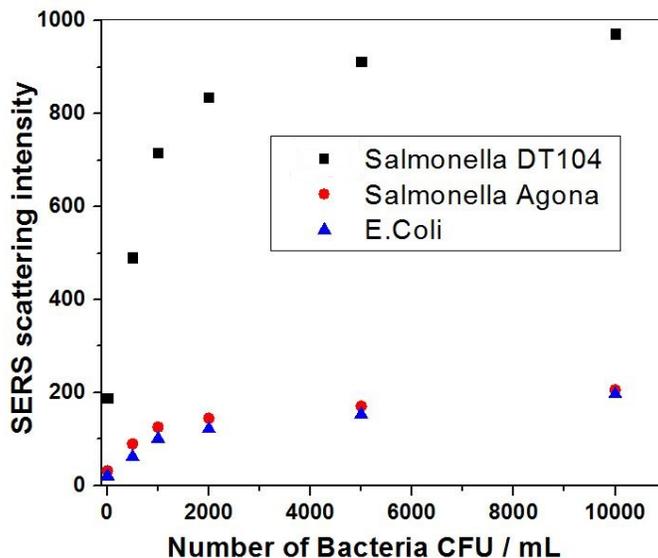


Figure 1. Plot showing SERS scattering intensity change at 1590 cm^{-1} upon the addition of different concentrations (CFU / mL) of *Salmonella DT104*, *Salmonella Agona*, *E. Coli* to antibody-conjugated GNPOP.

To demonstrate that our assay is highly selective, we have also performed how SERS intensity changes upon the addition of *Salmonella Agona* and *E. Coli O157:H7*. We have not observed any significant SERS enhancement (as shown in Figure 1) even after the addition of 10^5 CFU/mL bacteria. On the other hand, we see significant SERS intensity change even after the addition of

only 10 *Salmonella DT104*. Because of the lack of strong interaction, nanoparticles do not produce enough hotspots in case of *Salmonella Agona* and *E.Coli O157:H7* and as a result, significant SERS enhancement has not been observed. This contrast difference clearly shows that our assay is highly specific for *Salmonella DT104* and even it can distinguish between different kind of bacteria.

The Temperature Increased Affected by the Shape of Gold Nanoparticles

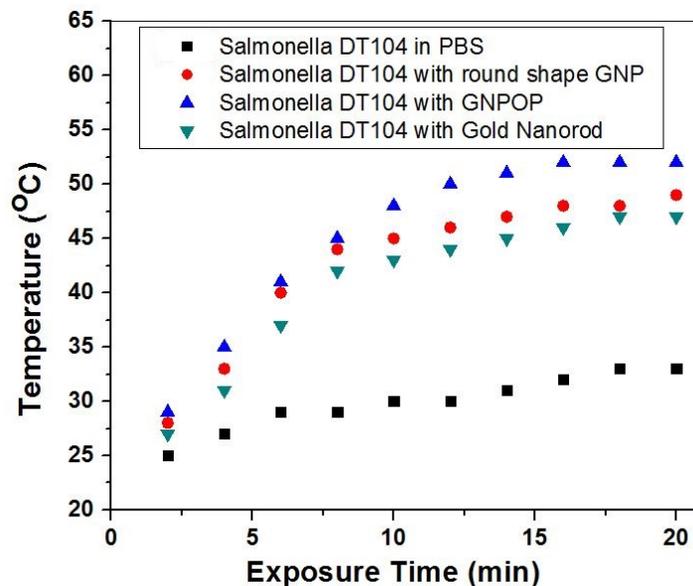


Figure 2. Plot showing photothermal heating curves during therapy process, when 670 nm laser with 1 W/cm² power has been exposed for 20 min.

Next, to understand how the temperature rises during photothermal therapy, we have performed thermal imaging at every 2 minute interval during therapy process using MikroShot Camera. As shown in Figure 2, the temperature increases by about 52 °C, when 670 nm laser with 1 W/cm² power has been exposed to GNPOP attached *Salmonella DT104*, while temperature increases to 49 °C, 47 °C in the case of round shape GNP attached *Salmonella* and Gold nanorod attached *Salmonella*. As shown in Figure 3, the GNPOP has comparative higher photothermal efficiency. The comparative higher photothermal efficiency of GNPOP may be due to two possible reasons: One is that the laser frequency was close to the maximum absorbance of GNPOPs than round shape GNP and Gold nanorod, resulting in higher photothermal efficiencies; another possible reason is that several narrow, nanoscale corners were capable of focusing the field at their apexes, which could provide considerable enhancement of photothermal efficiency. On the other hand, in the same condition, temperature increases only to 33 °C in the case of *Salmonella DT104* in PBS, which confirm that gold nanoparticle play a vital role in the photothermal therapy.

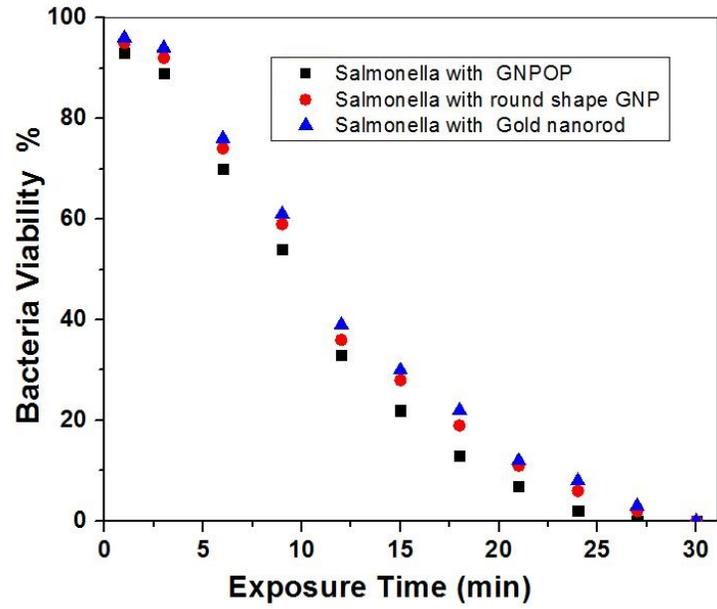


Figure 3. A plot showing bacteria viability measurements when GNPOP, round shape GNP and Gold nanorod conjugated with *Salmonella DT104* using 1 W/cm² 670 nm light for 30 min.