Dark-field microscopic detection of bacteria using bacteriophage-modified SiO_2@AuNP core-shell nanoparticles.

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Keywords: Bacteriophage; Bacterial detection; Dark-field microscopy; Gold nanoparticle; Metal nanoparticle

Bacterial infections are serious worldwide threat to public health, and so the accurate and rapid detection and identification. Bacteriophages are naturally occurring viruses of bacteria that only infect bacterial cells and are harmless to mammalians. Among a wide variety of biological materials, bacteriophages have received increasing attention as promising alternatives to antibodies in biosensor applications. Herein we present a rapid and highly selective detection method for pathogenic bacteria, which combines dark-field light scattering imaging with a plasmonic biosensor. The biosensor was prepared by immobilizing phages on the surfaces of the SiO_2@AuNPs core−shell nanoparticles. The biosensor selectively bound to *S. aureus* and significantly increased the scattering contrast of *S. aureus* (**Figure 1**). This method is capable of discrimination not only at the genus level but also at the species level. The detection limit for *S.aureus* was ~1×10^4 cfu/mL, and the quantification of target bacteria over a wide range of concentrations was accomplished within 15-20 min after addition of the biosensors to the bacterial solution.

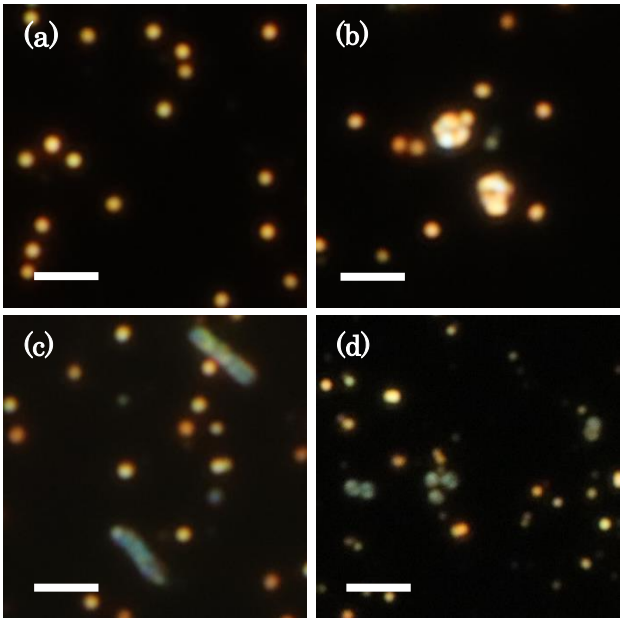

Figure 1. Dark field images of SiO_2@AuNPs mixed with (b) S.aureus, (b)E.coli and (c) *S.pseudintermedius.* Scale bar is 10 μm.

Imai, Masashi, *et al*., *Anal.Chem.* **2019**, *19*, 12352-12357.