Harnessing Bacterial Lipid Coatings on Gold Nanoparticles for Enhanced Cell Adhesion Applications

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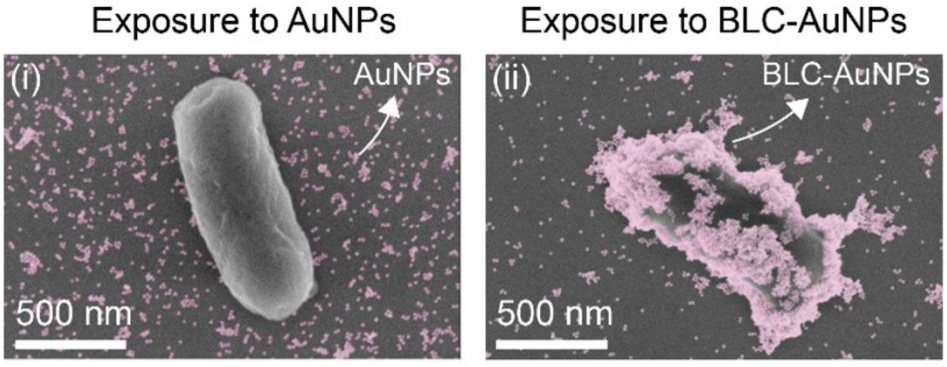
Introduction: Antimicrobial resistance (AMR) is a public health threat, causing millions of deaths annually. The misuse and overuse of antibiotic drugs have led to the rise of drug-resistant pathogens. Without novel treatments for AMR, current antibiotics can decline in efficiency. Nanoparticles (NPs), particularly when coated with bacterial membranes, can offer an alternative platform to potentiate existing antibiotics. The homotypic properties of cell membrane coating on NPs are hypothesised to increase nanoparticle-cell adhesion. In this study, we have isolated the lipid of *Escherichia coli* and used the harvested lipids as a coating for inorganic material such as gold nanoparticles (AuNPs) and re-exposed to host cells to test for enhancements in drug delivery.
Aim: Testing the drug delivery potential of bacterial membrane lipids as NP coatings. This study aims to reduce the burden of AMR using biomimetic bacterial lipid coated gold nanoparticles (BLC-AuNPs).
Methods: Bacterial lipids were isolated using Folch method. Liposomes were prepared through extrusion. BLC-AuNPs synthesized through vesicle fusion (sonication). Various microscopic and spectroscopic techniques were utilised to characterize BLC-NPs and their interaction with their host cells (*E. coli*).
Conclusion: BLC-AuNPs were able to adhere to *E. coli* at a much higher frequency than bare AuNPs, showing that the addition of a bacterial lipid coating can increase the affinity of NPs to their respective host cells upon re-exposure and therefore may enhance drug delivery to pathogenic bacteria. Factors such as the NP coating, lipid composition, ionic strength and surface charge can greatly impact the observed interaction between NPs and bacteria.

Keywords:
Bacterial membrane, gold nanoparticle, biomimetic coating, lipid coated particles, cell adhesion, uptake



Differences in coating pattern between E. coli cells exposed to Bare AuNP (i) and BLC-AuNP (ii).