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Synergistic antimicrobial therapy using nanoparticles and antibiotics for the treatment of multidrug resistant bacteria

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A ntibiotics have been widely used for the treatment of infectious disease owing to their ability to specifically target bacterial cells. However, a world-wide increase in the disease/infections caused by Multi-Drug Resistant (MDR) bacteria has become a great threat to public health. Synthetic materials such as polymers and nanoparticles exhibit broad spectrum activity against bacterial species, but NPs lack specificity and can cause toxicity to mammalian cells leading to restrictions on their use. The combination of antibiotics and NPs is a promising therapeutic approach to combat MDR bacteria as it can reduce the requirement of high dosages as well as enhance their antimicrobial activities. Conventional methods for the treatment of MDR infections involve a combination of different antibiotics. However, they are susceptible to lose their efficacy due to increasing antibiotic resistance. Here, we hypothesize that combining the specificity of antibiotics and broad spectrum activity of NPs could yield synergistic combinations for antimicrobial therapy against MDR infections. However, engineering of NPs can increase the selectivity of combination therapy. In order to test this hypothesis, we used hydrophobic functionalized C12-AuNPs that can strongly interact with bacteria. C12-AuNPs in combination with fluoroquinolone antibiotics displayed 4-fold decrease in the MIC values against MDR *E. coli*. Synergy arising from combination of EtBr inside the bacterial cells upon incubation with NPs. Moreover, using proteomics analysis these cells exhibited altered expression of outer membrane proteins which are responsible for several drug resistance mechanisms such as efflux pump channels, porins and lipoproteins.

Biography

Neveen Mohamed M Saleh has completed her PhD from Ain Shams University and Postdoctoral studies from Massachusetts, Amherst (UMASS) University in Nanotechnology, Chemistry Department. She is currently a Microbiological Researcher in National Organization for Drug Control and Research. She has published more than 10 papers in reputed journals.

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