Determining Antimicrobial and Synergistic Properties of Silver Coated Carbon Nanotubes and Antimicrobial Peptides against Streptococcus pyogenes

Rastogi, Ruchir

Streptococcus pyogenes is the bacterium responsible for streptococcal pharyngitis, impetigo, and rheumatoid fever. As antibiotics are often ineffective due to increasing antibiotic resistance, my objective was to formulate a novel antimicrobial compound against this bacteria. Recently, scientists have separately studied the antimicrobial properties of antimicrobial peptides and nanotubes, which pose adverse cytotoxic effects. However, I proposed that a compound containing silver coated carbon nanotubes (AgCNT) functionalized with antimicrobial peptide 557 (AMP 557) would possess synergistic properties that would make it a more potent antimicrobial agent. This ionic compound, named f-AgCNT, was produced by mixing equal amounts of positively-charged AgCNT with negatively-charged AMP 557. To compare each compound's antimicrobial activity, minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) assays were carried out to determine the lowest concentration of each compound that could inhibit and kill bacteria, respectively. MIC assays showed that a 12.5 µg/ml f-AgCNT solution was twice as effective as AMP 557 and sixteen times as effective as AgCNT. Similarly, MBC assays indicated that a 400 µg/ml solution of f-AgCNT was bactericidal, whereas similar concentrations of AgCNT or AMP 557 were just bacteriostatic. Further, plate count assays proved that a 100 µg/ml solution of f-AgCNT inhibited 99% of bacterial growth; same concentrations of AgCNT and AMP 557 inhibited only 30% and 65% of bacterial growth, respectively. In all assays and at all concentrations, the f-AgCNT nanoparticle was the most effective of the three compounds. Thus, the f-AgCNT compound can potentially function as a novel antimicrobial agent against S. pyogenes.

Awards Won:
Third Award of $1,000