Nano Is Novel: Improving Antibiotic Efficacy for S. epidermidis with Structurally Modified Silver

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With the WHO predicting antibiotic-resistant infections to claim 300 million lives by 2050-a number that exceeds the rates of cancer and heart disease combined-, our society is facing a daunting threat. The emerging field of nanotechnology, however, seems to be just the savior we need. While many nanomaterials exhibit unique properties between 1-100 nanometers in size, previous research observed silver nanoparticles(AgNPs) display antibacterial properties that can be used beneficially. Not only does silver exhibit antibacterial properties, but at the nano-scale also promotes cell-membrane penetration and essentially cellular death. The combinational therapy of antibiotics AgNPs, therefore, is a novel and promising solution to the crisis. To improve the efficacy of this therapy, however, structural modifications are key. This project looks at variations in nanoparticle size and shape to study their effect on antibiotic efficiency. This combination therapy is tested on Staphylococcus epidermidis, one of the most common strains that causes antibiotic-resistant infections. Furthermore, three different antibiotics-penicillin, neomycin and vancomycin-are combined with nanoparticles to better understand the multifaceted effect of this synergistic solution. In order to determine the success of this method, spherical and triangular AgNPs of different sizes were synthesized and the efficacy of the antibiotic-nanoparticle combination was tested via antibiotic sensitivity assays. The collected data was then statistically examined with ANOVA and Dunnett's comparison test. The findings of this study confirmed that structural modifications of nanoparticles are significant in improving antibiotic efficacy, showing a 32% improvement of vancomycin, 23.5% of neomycin and 11% of penicillin

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