NANO Today, HUGE Tomorrow: Improving Antibiotic Drug Delivery with Nanoparticles

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Antibiotics have become a vital element of modern medicine with many people calling them “miracle drugs.” Nonetheless, the misuse and overuse of these medical messiahs has led to an increase in resistance. Many bacterial strains are no longer influenced by conventional antibiotics and many more are rising in threat. Nanobiotechnology, on the other hand, is an emerging study that might just save humanity from an unveiling medical crisis. This project looks at a variety of nanoparticles and factors to potentially improve antibiotic drug delivery. Conducting a disk diffusion assay with two different bacterial strains, gram-negative E. coli and gram-positive S. epidermidis, nanoparticles of different variations were compared to penicillin in antibacterial efficiency. Following the aseptic procedures, bacterial strains were grown on LB nutrient agar, and filter discs soaked in the respective antibacterial solutions were placed on the surface. Nanoparticles that were tested include colloidal silver, colloidal copper, colloidal gold, silver nitrate and titanium dioxide and variations include nanoparticle pH and concentration. In order to arrive at a conclusion, the diameter of inhibition zones surrounding the antibacterial disks were measured and analyzed. While silver nitrate and a higher concentration of nanoparticles proved to be the most efficient for both strains, pH performance varied by nanoparticle and bacteria. Upon analyzing the data, it was found that the combination of nanoparticles with penicillin showed a 2% antibacterial improvement against E. coli and 80% against the penicillin-resistant S. epidermidis. This study further confirms that nanoparticles will play a huge role in tomorrow’s medicine.

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