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Abstract

Antimicrobial Applications of Nanotechnology

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Abstract:

The increasingly high incidence of bacterial resistance to antibiotics along with the high prevalence and incidence of bacterial infections necessitate a modern and novel generation of antibiotics. Nanotechnology, a field of applied science and technology that utilizes materials in scales smaller than 1 micrometer, has opened new horizons in medicine and has shown promising results in eliminating and lowering the activity of multiple microorganisms. Nanoparticles smaller than 100 nanometers that are used as antimicrobial agents penetrate the microorganism membrane by different mechanisms and change their susceptibility, resistance and viability1. This study investigated the effectiveness of zinc oxide, silver, copper, iron oxide, and aluminium oxide nanoparticles in eliminating or deactivating microorganisms. Additionally, this studyaddressed the essay techniques such as optical density measurement, crystal violet staining and MTS/MTT/XTT assays that evaluate bacterial viability with their advantages and disadvantages along with a review of the mechanisms of effectiveness of nanoparticles as antimicrobial agents. Zinc oxide (Figure 1) and silver nanoparticles are significantly effective in reducing bacterial viability. The most important characteristics in effectiveness of antimicrobial nanoparticles are the particle size (diameter) and surface charge. The smallest nanoparticles are the strongest antimicrobials and a positive surface charge increases the antibacterial effect.

Biography:

Thomas J. Webster's (H index: 94) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995) and in biomedical engineering from Rensselaer Polytechnic Institute (M.S., 1997; Ph.D., 2000). He is currently the Art Zafiropoulo Chair and Professor in the Department of Chemical Engineering at Northeastern

University in Boston, but has also been a professor at Purdue and Brown Universities. Prof. Webster has graduated/supervised over 212 students and has published over 733 peer-reviewed articles. He has formed over a dozen companies with numerous FDA approved implants. Prof. Webster currently co-directs 4 centers and is a fellow is 9 different societies. He has appeared on numerous media outlets including the recent special 'Year Million' on National Geographic talking about the future of medicine and science.

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