The Antimicrobial Effect of Heavy Metals Nanoparticles on Bacteria

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The World Health Organization (WHO) has declared antimicrobial resistance (AMR) as one of the ‘biggest threats to global health’. Around 25,000 deaths per annum have been estimated in the European Union because of AMR. Though numerous antimicrobial drugs often lack effectiveness against recently developed multidrug-resistant (MDR) microorganisms. This study aimed to examine the effectiveness of anti-microbial drugs using green technology and nanoparticles on different bacteria. For this purpose, green synthetic protocols were used to avoid any hazardous products. The methodology contains two phases. Initially, nanoparticle preparation uses 2 different metal sources and plant extract (Linden), capsulation uses an alginate solution to prevent coagulation of the drug. X-ray diffraction (XRD) was used for elemental and morphological characterization. In the second phase, our antimicrobial nanoparticle was tested on E. coli. For our preliminary experiment copper and nickel, nanoparticles were found to have an effective bactericide effect on the growth of E. coli. At lower concentrations of nanoparticles, fewer bacteria were inhibited so more light is scattered which means optical density increases, whereas at higher concentrations bacterial growth ceased, so less light is scattered. To sum up, these nontoxic nanomaterials, which can be prepared depending on different parameters including size, shape, and the surface charge of the particles in a simple and cost-effective manner, may be suitable for the formulation of new types of bactericidal materials. In order to avoid the use of chemical antibiotics that bacteria can resist; our results showed promising antibacterial effects on different common strains of bacteria.