# The Effects of Silver Nanoparticles on the Ionic Silver Resistance Plasmid (pMG101)

Martinez, Adam

Ionic silver is known to be an effective antimicrobial that is commonly used in cleaning products and to treat pathogenic infections in medicine; however, through evolution, certain strains have developed a resistance to ionic silver. A novel study was performed to assess the effectiveness of silver nanoparticles, another form of silver, in inhibiting the growth of ionic silver resistant bacteria. The experiment monitored the growth of silver resistant bacteria E. coli J53(pMG101) in the presence of different sizes and concentrations of silver nanoparticles after 24 hours of incubation on a 96-well microtiter plate using optical density at 600nm. In addition, a strict protocol of positive and negative controls dealing with contamination, confirmation of silver resistance, and validation of silver nanoparticle concentrations was used. BLAST bioinformatic analysis of previously identified silver resistance genes showed high genetic similarities (85%-100%) to E. coli J53(pMG101); suggesting that results from this experiment apply to all silver resistant bacteria with similar mechanisms. The results demonstrated that silver nanoparticles are not a viable alternative to ionic silver in combating silver resistant bacteria. Furthermore, silver resistant bacteria E. coli J53 significantly increased in growth when exposed to 1 millimolar silver nitrate, relative to untreated samples ($p<0.05$). In a clinical setting, this unexpected observation suggests that the treatment of a silver-resistant bacterial infection with ionic silver can actually increase its progression. Therefore, the identification of silver resistant bacteria before the application of the antimicrobial becomes of paramount importance.

**Awards Won:**
Fourth Award of $500