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Mechanisms of AgNPs-mediated antibiotic resistance in bacteria

Silver nanoparticles (AgNPs) are an important class of nanomaterials, largely due to their outstanding antibacterial properties. However, little is known about their toxicity and environmental impacts. In this study, we report that AgNPs lead to growth inhibition and oxidative stress in gram negative bacteria; *Escherichia coli* and gram positive bacteria; *Staphylococcus aureus*. Interestingly, bacteria pre-exposed to AgNPs exhibit increased minimal inhibitory concentration (MIC) and minimal biocidal concentration (MBC) when treated with diverse antibiotics (ampicillin, penicillin, chloramphenicol and kanamycin). The bacterial resistance to antibiotics is accompanied with less permeable membranes, lower levels of oxidative stress, decreased membrane potential and elevated levels of intracellular ATP found in AgNP-treated bacteria compared to their untreated counterparts. These results underscore a potential consequence of the inadvertent exposure of AgNPs to bacteria in the environment, and highlight the need to regulate the disposal and use of silver nanoparticles in consumer products and industry.

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