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Nanotechnology 2018: Updated trends on antimicrobial action of silver nanoparticles- Hind AA Al Zahrani - University of Jeddah

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Silver nanoparticles (AgNPs) are widely spread worldwide for several centuries and are extremely utilized in industry, cosmetics, food packaging for its proposed antimicrobial activities. Many reports mentioned the good value of AgNPs in many faces. This review focused on antimicrobial activities of AgNPs, subjecting briefly to their synthesis, with a special specialise in different mechanisms of action and factors affecting these activities as an antimicrobial agent. Introduction: Increasing hospital and community-acquired infections thanks to bacterial multidrug-resistant (MDR) pathogens that current antibiotic therapies aren't effectively to represent a growing problem. Antimicrobial resistance is, thus, one among the main threats to human health, since it determines a rise of morbidity and mortality as a consequence of the foremost common bacterial diseases. Resistance genes have recently emerged, favored by improper use of antibiotics; hence, the primary step in combating resistance envisions the reduction of antibiotic consumption. Antimicrobial resistance may be a complex mechanism whose etiology depends on the individual, the bacterial strains and resistance mechanisms that are developed. The emergence of resistance against newly developed antibiotics further supports the necessity for innovation, monitoring of antibiotic consumption, prevention, diagnosis and rapid reduction within the misuse of those drugs. it's thus necessary to optimize antibiotics' pharmacokinetics and pharmacodynamics so as to enhance treatment outcomes and reduce the toxicity and therefore the risk of developing resistance. to deal with the matter of resistance, it'll be necessary to vary the protocols of use of antimicrobials in order that these drugs are administered only all other treatment options have failed and joint efforts of governments and academic networks are needed to fight against the globally spreading of multidrug-resistant pathogens. Today, there's a requirement to hunt alternative treatments. Non-traditional antibacterial agents are thus of great interest to beat the resistance that develops from several pathogenic microorganisms against most of the commonly used antibiotics. AgNPs are used for several centuries as a biocidal in US in 1954. The guide for silver use silver antimicrobial was traditionally from many centuries in ancient Egypt and Rome. Ancient Egyptians were believed within the healing power and anti-microbial effects of silver power by using it before antibiotics; also the Phoenicians used the silver vessels for water and wine preservation during their long voyages. the primary report for the medical use of silver was as an eye fixed solution in 1884 by the utilization of 1% (AgNO3) (Russell and Hugo 1994). Recently, silver compounds is suggested topically as antibacterial cream for burn wounds and still used till now. However, some cytotoxic effects and lots of limitations to the clinical use of silver materials are reported. In China, AgNPs were used for its antimicrobial action in many places as elevators and railway stations various forms (organic and inorganic), but the mostly stable one are +0 and +1, although it also exists in (+2, +3) forms AgNPs differs consistent with sizes (1-100 nm), shape(wires, spheres, triangles, rods), and coatings (polymer, peptide, sugars, citrate) but most forms are derived from nitrate which is that the main agent use within the synthesis of AgNPs. Modern advances in nanotechnology, improved the assembly of silver at nanoscale vercoming many cytotoxic limitations with a broad use in many applications including electronic and transparent conductor applications, antimicrobial effects in goods and medical products which leads the expansion of the nanosilver market. The sole fact about Silver is that the highly toxicity of it and related compounds against many microorganisms. This fact reflects the main roles of AgNPs in medical applications. The foremost predominant sort of silver is nitrate , but the nanoparticle form provides major advantage by presence of more area for microbe exposure which opens the door about many various uses for its antibacterial action.

The unique physical, chemical and biological characters of AgNPs attracted the interest compared to usual macro silver. AgNPs differs completely in their properties from silver as they has higher catalytic activity, higher chemical stability and better electrical and thermal conductivity which makes them of potential value in many applications like inks, microelectronics, and medical imaging.

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