ANTIMICROBIAL FORMULATION BASED ON SILVER NANOPARTICLES FOR APPLICATION IN RESPIRATORY FILTERS

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SUMMARY

Among the various applications of silver nanoparticles (AgNPs), their antimicrobial properties stand out. AgNPs can kill bacteria, fungi, yeasts and virus inactivation. This research aimed to develop a formulation containing AgNPs for surface disinfection with long-lasting antimicrobial activities. For this, the silver nanoparticles were prepared according to the chemical method based on the principles of green nanotechnology. Thus, two different nanoparticles were developed, obtaining different sizes and shapes for an optimized final formulation. The characterization and optimization of AgNPs were performed by UV-Vis spectrometry; dynamic light

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scattering; Zeta potential and transmission electron microscopy. After optimization, AgNPs were added in a formulation with adhesion capacity and the antimicrobial efficacy was determined by the minimal inhibitory concentration and by the parallel lines method. After obtaining the nanoparticle synthesis formulation with the desired characteristics related to absorption, size, shape and surface charge, the AgNPs were added to a polymeric formulation to provide greater stability for the nanoparticles against exposure to light and application environment and ensure longer permanence time. The final formulation of AgNPs confirmed the antibacterial action spectrum in the minimum inhibitory concentration test showed efficacy against all bacteria used, including *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*, *Salmonella Heidelberg*, *Klebsiella pneumoniae*, *Pseudomona aeruginosa*, *Mycobaterium smegmatis and Mycobaterium smegmatis* peregrine. According to the parallel line method, for the bacteria *Staphylococcus aureus* and *Klebsiella pneumoniae*, the yeast *Candida albicans* and the filamentous fungus *Aspergillus brasiliensis*, the formulation prevented the formation of colony-forming units in the perimeter that surrounds the lines that contained the substrate containing the formulation of AgNPs. The developed formulation showed satisfactory results about its broad-spectrum antimicrobial effect against Gram-positive, Gram-negative bacteria, mycobacteria, yeasts and filamentous fungi, conferred by the addition of AgNPs in a polymeric system with adhesion capacity and was successfully applied in a filtration system for use in mechanical ventilation resulting in a national patent and a product for the medical-hospital area.

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