

Abstract

Antibacterial Activity of Polymeric Nanoparticles with Ceftazidime Against ESBL-Producing *Klebsiella pneumoniae*[†]

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Introduction: The resistance of Gram-negative bacteria to ceftazidime (CAZ) represents a global challenge, limiting therapeutic strategies and hindering infection control. The drug's action depends on the β -lactam ring, which inhibits bacterial cell wall synthesis. In this context, modified polysaccharides, such as acetylated cashew gum (ACG), emerge as potential nanocarriers, as they present biocompatibility and modifiability, allowing the controlled and targeted release of drugs. Thus, the objective of the study was to synthesize and characterize ACG nanoparticles for the incorporation of CAZ, as well as to evaluate their antimicrobial potential. **Methodology:** The gum was acetylated under stirring for 24 h and was subsequently precipitated, washed, and dried in hot air. It was then characterized by ¹H NMR, FTIR-ATR and UV-vis. In the synthesis of nanoparticles, ACG and CAZ were dissolved under stirring and dialyzed, filtered, lyophilized, and characterized by DLS technique. The minimum inhibitory concentration (MIC) against *K. pneumoniae* (ATCC 700603) was determined by serial dilution in Mueller–Hinton broth. **Results:** FTIR confirmed acetylation by the presence of bands at 1736 and 1216 cm^{−1}, and NMR showed typical signals of acetyl groups. The nanoparticles had a diameter of 95.32 nm, a PDI of 0.047, and a zeta potential of −96.7 mV, suggesting colloidal stability. Spectroscopic analyses indicated encapsulation of CAZ in the polymer matrix. Bacterial growth was inhibited, with a MIC and a MBC of 2.50 µg/mL for the nanoparticle and 6.75 µg/mL for the free drug. **Conclusion:** The formulated nanoparticles presented viable drug delivery systems, contributing to the improvement of antibacterial activity at low concentrations against the extended-spectrum β -lactamase (ESBL) strain.



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