# SYNTHESIS AND CHARACTERIZATION OF HBPEI-Ag-CHITOSAN HYBRID MEMBRANES: THEIR POTENTIAL AS GENTAMICIN CARRIERS

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## ABSTRACT

Silver nanoparticles (Ag NPs) have attracted much attention for the development of new antimicrobial systems. Ag NPs have shown much better antimicrobial activity than other metals. Many researches have focused on the synthesis of polymer functionalized metal nanomaterials for various applications and especially in biomedical applications [1-2]. Hyperbranched poly(ethylene)imine (HBPEI) is an amine-containing polymer which is soluble in water and exhibits buffering capacity. Furthermore, HBPEI is believed to act as a reducing and a stabilizing agent. Cavities in the structure of HBPEI constitute a unique microstructural feature and make HBPEI a favorable choice for drug storage and controlled drug release. However, its application in biomedical fields is limited due to the high concentration of amino groups at the periphery especially at high molecular weights. To overcome this problem, a commonly used strategy is to develop modified HBPEI derivatives [3-6]

Chitosan (CS) is a non-toxic biopolymer that exhibits outstanding properties, beside biocompatibility and biodegradability, due to the presence of primary amines along the chitosan backbone [7]. A combination of HBPEI and Chitosan could result in the synthesis of a copolymer with enhanced buffering capacity and biocompatible behavior, owing to the corresponding HBPEI and Chitosan molecules [8-10].

Thus we produced HBPEI-Ag-Chitosan hybrid systems with different weight ratios. Firstly, a HBPEI-Ag complex in aqueous media was formed and then several amounts of chitosan, which was initially dissolved in 1% acetic acid, were added in order to reduce the toxicity of HBPEI. These nanoparticles are expected to have not only the combined properties of CS and HBPEI as mentioned, but improved colloidal stability in neutral aqueous environment or physiological salinity as well. TEM, UV-Vis, XRD, z-potential, DLS and FTIR techniques were used for the characterization of the colloids. TEM and UV-Vis characterization revealed the formation of spherical silver nanoparticles with a mean diameter at around 10 nm. The ability of the optimum hybrid system to encapsulate and release antibiotic agents such as gentamicin was also studied in terms of UV-Vis. Additional tests were conducted, in order to estimate toxicity of the specimens and assess a possible bactericidal capacity.

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