

**Efficacy of neutral and negatively charged liposome-loaded gentamicin on planktonic bacteria and biofilm communities**

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We investigated the efficacy of liposomal gentamicin formulations of different surface charges against *Pseudomonas aeruginosa* and *Klebsiella oxytoca*. The liposomal gentamicin formulations were prepared by the dehydration-rehydration method, and their sizes and zeta potential were measured. Gentamicin encapsulation efficiency inside the liposomal formulations was determined by microbiologic assay, and stability of the formulations in biologic fluid was evaluated for a period of 48 h. The minimum inhibitory concentration and the minimum bactericidal concentration were determined, and the *in vitro* time kill studies of the free form of gentamicin and liposomal gentamicin formulations were performed. The activities of liposomal gentamicin in preventing and reducing biofilm-forming *P. aeruginosa* and *K. oxytoca* were compared to those of free antibiotic. The sizes of the liposomal formulations ranged from 625 to 806.6 nm in diameter, with the zeta potential ranging from 0.22 to -31.7 mV. Gentamicin encapsulation efficiency inside the liposomal formulation ranged from 1.8% to 43.6%. The liposomes retained >60% of their gentamicin content during the 48 h time period. The minimum inhibitory concentration of neutral formulation was lower than that of free gentamicin (0.25 versus 1 mg/L for *P. aeruginosa* and 0.5 versus 1 mg/L for *K. oxytoca*). The negatively charged formulation exhibited the same bacteriostatic concentration as that of free gentamicin. The minimum bactericidal concentration of neutral liposomes on planktonic bacterial culture was twofold lower than that of free gentamicin, whereas the negatively charged formulations were comparable to free gentamicin. The killing time curve values for the neutral negatively charged formulation against planktonic *P. aeruginosa* and *K. oxytoca* were better than those of free gentamicin. Furthermore, liposomal formulations prevent the biofilm-formation ability of these strains better than free gentamicin. In summary, liposomal formulations could be an effective lipid nanoparticle to combat acute infections where planktonic bacteria are predominant.

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