Impact of chitosan coating of anionic liposomes on clearance rate, mucosal and systemic immune responses following nasal administration in rabbits

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Abstract

Liposomes have been identified as effective immunological adjuvants and have potential for the intranasal and oral delivery of protein antigen. Anionic MLV liposomes were prepared by dehydration-rehydration method. For coating, liposomes were incubated in chitosan solution. Efficiency of coating was confirmed by the evaluation of FITC-labelled chitosan-coated liposomes using a fluorescent microscope. Liposomes morphology and size were studied by optical microscope and size analyzer. Mucoadhesion potential of liposomes was evaluated in human nose by gamma-scintigraphy using \(^{99m}\)Tc-labelled liposomes. Rabbits (4 animals per group) were nasally immunized in weeks 1, 2, and 3 by liposomes encapsulated with 1% Lf TT. Bleedings and lavage collections were taken place in weeks 1 and 2, and IgG and sIgA titers were measured by ELISA method. Liposomes had a mean diameter of 174.8 μm. Loading of TT was 58.7 ± 12.1%. The mucoadhesion (clearance rate from nose) of both coated and non-coated liposomes was similar (P > 0.05). Among the immunized animals, the highest nasal lavage sIgA titers were seen in non-coated liposomes followed by coated ones. The serum IgG titers (4th bleeding) in animals immunized by both kinds of liposome were similar (P > 0.05), and were lower than the TT solution group (P < 0.05). Immunization by i.m. injection of TT solution resulted in the lowest sIgA and highest IgG titers (P < 0.05) compared with liposomal groups. The results were indicative of good potential of negatively charged liposomes in the induction of mucosal immunity. Coating of liposomes by chitosan, failed to increase both the residence time of liposomes in nasal cavity and systemic responses. Conversely, coated liposomes could not induce the mucosal responses as efficiently as non-coated liposomes. It seems that the coating of liposomes affected their interaction potential with nasal associated lymphoid tissue cells. © 2009 Elsevier B.V. All rights reserved.

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