Dextran microspheres could enhance immune responses against PLGA nanospheres encapsulated with tetanus toxoid and Quillaja saponins after nasal immunization in rabbit

Maliheh Mohaghegh¹, Mohsen Tafaghodi¹,²

¹School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran
²Pharmaceutical Research Center

Address for Correspondence: Mohsen Tafaghodi, School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran. Tel: +98 511 8823255; Fax: +98 511 8823251. E-mail: tafaghodim@mums.ac.ir

Potent immunoadjuvants are needed to elicit responses following mucosal delivery. PLGA (poly[D,L-lactic-co-glycolic acid]) nanospheres, Quillaja saponin (QS) and cross-linked dextran microspheres (CDM) as drug delivery and absorption enhancer adjuvants were evaluated. PLGA nanospheres were prepared by solvent evaporation method. Particulate characteristics of nanospheres were studied by optical and scanning electron microscopes and dynamic light scattering technique. The mean diameter of nanospheres encapsulated with TT and TT + QS determined as 425 and 390 nm. Loadings of TT and QS were 30 ± 1.9% and 23 ± 2.8%. Nanospheres encapsulated with TT or QS were intranasally administered to rabbits, three times in two-week intervals and the serum IgG and nasal lavage IgA titers were determined by ELISA. The serum IgG titer induced with (TT)PLGA nanospheres was higher than TT solution (P < 0.001). IgG titers induced with (TT + QS)PLGA was higher than (TT)PLGA (P < 0.0001). When (TT)PLGA and (TT + QS)PLGA nanospheres were mixed with CDM, higher IgG titers were induced (P < 0.001). The highest mucosal sIgA titers were seen in animals immunized with (TT + QS)PLGA + CDM. Co-encapsulation of QS and TT in PLGA nanospheres increased sIgA titers. In conclusion, the highest immune responses were observed by concomitant use of three adjuvants.

Keywords

Nasal immunization, tetanus toxoid, Quillaja saponin, cross-linked dextran microspheres, PLGA nanosphere