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Formulation, characterization and release studies of alginate microspheres encapsulated with tetanus toxoid

Tafaghodi, M.[ab], Sajadi Tabasi, S.A.[ac], Jaafari, M.R.[ad]

[a] School of Pharmacy, Mashhad University of Medical Sciences, P.O. Box 91775-1365, Mashhad, Iran

[b] Pharmaceutical Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

[c] Pharmacological Research Center of Medicinal Plants, Mashhad University of Medical Sciences, Mashhad, Iran

[d] Biotechnology Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Abstract

View references (25)

Alginate is a safe, non-immunogenic and inexpensive natural polymer with high mucoadhesive properties. Alginate microspheres can be used as a delivery system for antigens to mucosal surfaces. In the present study alginate microspheres were prepared by an emulsification technique. The effects of sonication time, concentration of alginate, emulsifier and calcium chloride, and also the volume of calcium solution, were evaluated on mean size, size range, surface roughness and porosity, sphericity and clumping of microspheres using an optical microscope and particle size analyzer. The most desirable conditions were 90 s sonication, 3% alginate solution, 2% surfactant and 60 ml of 0.33% $CaCl_2$ in octanol. The resulting microspheres had a mean size of 1.34 ± 0.3 μm and size range of 0.3 ± 2.0 μm, with no surface roughness and porosity, low clumping and high sphericity. The encapsulation efficiency was about 47.7%. All batches showed nearly the same release profiles with a low burst release. The stability of the model antigen (tetanus toxoid (TT)) extracted from microspheres was confirmed by SDS-PAGE; and the antigenicity of TT was studied by ELISA and found to be 91 ± 5% of the original TT. It can be concluded that, with regard to the size and morphological characteristics of the prepared microspheres and their ability in preserving the antigenicity of the encapsulated TT, they could be used as a delivery system for mucosal delivery of TT. © VSP 2006.

Reaxys Database Information

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Author keywords

Alginate; Characterization; Microsphere; Preparation; Tetanus toxoid

Indexed Keywords

Engineering controlled terms: Antigens; Calcium compounds; Emulsification; Encapsulation; Porosity; Surface roughness

Engineering uncontrolled terms: Alginate microspheres; Sonication; Sphericity; Tetanus toxoid

Engineering main heading: Polysaccharides

EMTREE drug terms: alginic acid; calcium alginate; calcium chloride; emulsifying agent; microsphere; octanol; surfactant; tetanus toxoid

EMTREE medical terms: analyzer; article; chemical structure; controlled release formulation; controlled study; drug antigenicity; drug delivery system; drug solubility; emulsion; encapsulation; enzyme linked immunosorbent assay; immunoreactivity; microscopy; particle size; polyacrylamide gel electrophoresis; priority journal; ultrasound

MeSH: 1-Octanol; Alginates; Biocompatible Materials; Calcium Chloride; Delayed-Action Preparations; Drug Compounding; Drug Delivery Systems; Drug Stability; Glucuronic Acid; Hexuronic Acids; Materials Testing; Microscopy, Electron, Scanning; Microspheres; Mucous Membrane; Particle Size; Solutions; Sonication; Surface-Active Agents; Tetanus Toxoid
Medline is the source for the MeSH terms of this document.

Chemicals and CAS Registry Numbers: alginic acid, 28961-37-7, 29894-36-8, 9005-32-7, 9005-38-3; calcium alginate, 9005-35-0; calcium chloride, 10043-52-4; octanol, 111-87-5, 29063-28-3;