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Using nanocarrier systems for Vaccine distribution through nonparenteral administration

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Abstract

There is a huge drive in the vaccine research field and pharmaceutical industry for effective targeting of antigen presenting cells APCs) to enhance the immune response and for needle-free vaccination. The aim of this study was to adsorb pneumococcal antigen (PA), onto in house developed polymer-based nanoparticles (NPs) to target lung APCs. Further to formulate these NPs into dry powder nanocomposite microparticles (NCMPs) suitable for pulmonary vaccine delivery.NPs were prepared using an emulsion solvent evaporation method and PA was adsorbed onto the surface of NPs (100: 20). The NPs were spray-dried in an aqueous suspension of leucine to produce NCMPs and characterised in terms of particle size, loading, cell viability, protein stability (SDS-PAGE), antigenicity (ELISA), immunization and aerosolisation studies.The NPs produced were 322.83 ± 4.25 nm in size with PA loading 19.68 ± 2.74 µg/mg. The NCMPs resulted in a fine particle fraction (FPF%) >75%. The NPs appear to be well tolerated by APCs cell lines ≥90% cell viability) at 19.5µg/mL after 4h exposure. SDS-PAGE, and the antigenicity (>95%) confirmed that PA was stable in both formulations after spray-drying. The cfu in BALF of mice challenged with pneumococcal bacteria was signifcantly less compared to PA alone in the lungs or via subcutaneous injection.

Biography

Imran Saleem is a Professor in nanomedicine within the School of Pharmacy & Biomolecular Sciences, Liverpool John Moores University, UK. His research is aimed at developing novel delivery systems for targeting therapeutic agents to their site of action, with particular emphasis on lung diseases via pulmonary delivery. He has over 15 years of experience in the area of micro/nanoparticle formulation and drug delivery systems and has published extensively in peer-reviewed journals, conference abstracts, and book chapters. His research group is focused on the design and development of nanocarriers for the delivery of biomacromolecules including, genes, peptides, vaccines, and drugs.

Publications

1.Nanocarriers targeting dendritic cells for pulmonary vaccine delivery

2.Surfactant effects on lipid-based vesicles properties

3.Prediction of dry powder inhaler formulation performance from surface energetics and blending dynamics

4.Bovine serum albumin adsorbed PGA-co-PDL nanocarriers for vaccine delivery via dry powder inhalation

5.Micronization of a soft material: air-jet and micro-ball milling

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