NANOMATERIALS FOR NONINVASIVE SUBLINGUAL VACCINES

TURÁNEK Jaroslav, MAŠEK Josef, LUBASOVÁ Daniela, LUKÁČ Róbert, TURÁNEK-KNOTIGOVÁ Pavlína, KULICH Pavel, PLOCKOVÁ Jana, MAŠKOVÁ Eliška, PROCHÁZKA Lubomír, KOUDELKA Štěpán, BARTHELDYOVÁ Eliška, HUBATKA František, RAŠKA Milan, MILLER Andrew D.

Veterinary Research Institute, Department of Pharmacology and Immunotherapy, Brno, Czech Republic, EU Technical University of Liberec, Liberec; Veterinary and Pharmaceutical University, Brno; Palacky university, Olomouc; Czech Republic, EU; King's College London, London, United Kingdom, EU

Abstract

New nanofibre-based mucoadhesive film was designed and prepared for oromucosal administration of nanocarriers for delivery of drug and vaccines. The mucoadhesive film is constructed from electrospun nanofibrous layer, mucoadhesive film layer and protective backing layer. While mucoadhesive film layer is responsible for tight adhesion of whole system to the oral mucosa after the application, the electrospun nanofibrous layer serves as a reservoir for therapeutic nanoparticles such as polymeric nanoparticles, liposomes, and potentially broad spectrum of nanopaticles as lipoplexes, virosomes, virus-like particles, dendrimers as well as therapeutic macromolecular drugs, antigens and allergens. The extremely large surface and its functionalization together with high porosity of electrospun nanofibres allow high quantities of nanoparticles be loaded, thus providing a high particle to nanofibre mass ratio. Nanoparticles can either be reversibly adsorbed or linked by non-covalent bonds (e.g. metallochelating or electrostatic interactions) to the surface of nanofibers or can be deposited in the pores in between the nanofibers. Nanofibrous reservoir allows fast release of nanoparticles and the depo at the mucosal surface is formed for prolonged period after the application. Mucoadhesive film was thoroughly studied by TEM, SEM, AFM and confocal microscopy, (další techniky dopsat) and adsobtion of varoious nanoparticles like liposomes, viruses, pDNA, PLGA nanoparticles and bacterial ghosts was demonstrated. The designed system is applicable to oral mucosa, especially to sublingual and buccal tissues and enables trans-/intramucosal delivery of nanoparticles. As proof of concept, the mucosal and lymph node delivery of PLGA-PEG nanoparticles and liposomes was demonstrated in porcine model. The main potential application of the system is sublingual immunisation and development of "printed vaccine technology".

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