Biomedicine & Pharmacotherapy 107 (2018) 1311–1317

Contents lists available at ScienceDirect

Biomedicine & Pharmacotherapy

journal homepage: www.elsevier.com/locate/biopha

Bovine serum albumin nanoparticles induce histopathological changes and inflammatory cell recruitment in the skin of treated mice

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ARTICLE INFO

Keywords:
Albumin
Nanoparticles
Skin inflammation
Immunization

ABSTRACT

Albumin is a natural, biocompatible, biodegradable and nontoxic polymer and due to these features, nanoparticles made of albumin are a good system for drug or antigen delivery. Polymeric nanoparticles are being widely explored as new vaccines platforms due to the capacity of those nanoparticles to prime the immune system by providing sustained release of the antigen after injection. Biodegradable nanoparticles associated with proteins represent a promising method for *in vivo* delivery of vaccines. In our previous studies, bovine serum albumin nanoparticles (BSA-NPs) were identified as a promising system for in vivo delivery of microbial antigens. The aim of this work was to show the effect of BSA-NPs on skin after nanoparticles administration. The pro-inflammatory activity of BSA-NPs was evaluated using in vivo models. BSA-NPs are easily uptake by macrophagic RAW 264.7 and BHK-21 cells without any significant cytotoxicity. Histological examination of skin sections from BSA-NPs-treated mice revealed intense cellular infiltration, increased skin thickness, follicular hypertrophy, vascular congestion and marked collagenesis. Mice immunized with recombinant non-structural protein 1 (rNS1) from Dengue virus 1 and BSA-NPs showed a high seroconversion rate if compared to animals immunized only with rNS1. Therefore, the effect of BSA-NPs on skin after BSA-NPs administration has a biotechnological relevance to the rational design of vaccine formulations based on albumin nanocarriers. However in the next years future studies should be carried out to best characterize the effect of BSA-NPs on dendritic cells and establish the role of these nanoparticles as a new vaccine platform for infectious diseases or cancer.

1. Introduction

Albumin is a natural nanocarrier that is able to form non-covalent complexes with several natural and synthetic molecules. This protein is also biocompatible, biodegradable and nontoxic and due to these features, albumin based nanocarriers have attracted great attention and could be used for drug or antigen delivery [1,2]. In our previous studies, bovine serum albumin nanoparticles (BSA-NPs) were identified as a promising system for delivery of *Dengue virus* (DENV) and *Pseudomonas aeruginosa* antigens. Mice immunized with BSA-NPs with inactivated DENV adsorbed into their surface elicited a stronger IgG response [3]. In turn, immunization of mice with BSA-NPs with entrapped antigens of *P. aeruginosa* induces strong humoral responses against the bacteria and is also able to lower the inflammatory signs in lungs caused by nasal infection challenge with these live bacteria [4].

Polymeric nanoparticles based on biodegradable polymers have been widely explored as new vaccine platforms due to their ability to stimulate the immune system and provide sustained antigen release after vaccine administration [5,6]. Nanoparticles could be used as either a delivery system to enhance antigen processing and/or as an immunostimulant adjuvant to activate and potentiates the immunological response. Vaccines based on nanoparticles can be manipulated to optimize the immune response via selective targeting of antigen presenting cells [7,8]. Several works have used nanoparticles as therapeutic vaccines for cancer [9,10], but now this technology is being increasingly explored with a view to treating or preventing conditions

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https://doi.org/10.1016/j.biopha.2018.08.106
Received 17 May 2018; Received in revised form 4 August 2018; Accepted 22 August 2018