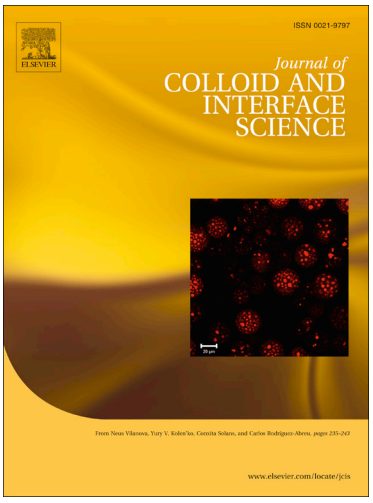

The combined magnetic field and iron oxide-PLGA composite particles: Effective protein antigen delivery and immune stimulation in dendritic cells

Chalathan Saengruengrit, Patcharee Ritprajak, Supason Wanichwecharungruang, Apoorva Sharma, Georgeta Salvan, Dietrich R.T. Zahn, Numpon Insin

PII: S0021-9797(18)30248-0
DOI: https://doi.org/10.1016/j.jcis.2018.03.008
Reference: YJCIS 23358

To appear in: *Journal of Colloid and Interface Science*

Received Date: 12 December 2017
Revised Date: 25 February 2018
Accepted Date: 2 March 2018

Please cite this article as: C. Saengruengrit, P. Ritprajak, S. Wanichwecharungruang, A. Sharma, G. Salvan, D.R.T. Zahn, N. Insin, The combined magnetic field and iron oxide-PLGA composite particles: Effective protein antigen delivery and immune stimulation in dendritic cells, *Journal of Colloid and Interface Science* (2018), doi: https://doi.org/10.1016/j.jcis.2018.03.008

The combined magnetic field and iron oxide-PLGA composite particles: Effective protein antigen delivery and immune stimulation in dendritic cells.

Chalathan Saengruengrit[1], Patcharee Ritprajak[2,3*], Supason Wanichwecharungruang[1], Apoorva Sharma[4], Georgeta Salvan[4], Dietrich R T Zahn[4], Numpon Insin[1**].

[1] Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, 10330 Thailand

[2] Research unit in oral microbiology and immunology, Department of Microbiology, Faculty of Dentistry, Chulalongkorn University, Pathumwan, Bangkok, 10330 Thailand

[3] Oral biology research center, Faculty of Dentistry, Chulalongkorn University, Pathumwan, Bangkok, 10330 Thailand

[4] Semiconductor Physics, Institute of Physics, Chemnitz University of Technology, 09107 Chemnitz, Germany

ABSTRACT

Superparamagnetic iron oxide nanoparticles (SPIONs) have received much attention in drug and biomolecule delivery systems. Here, we report a delivery system using the combination of a magnetic field and the relatively biocompatible composite particles of poly(lactic-co-glycolic acid) and SPIONs (SPION-PLGA particles) for protein delivery to bone-marrow derived primary dendritic cells (BM-DCs). SPIONs with the diameter of ~10 nm were synthesized via thermal decomposition of iron(III) oleate. The SPIONs and bovine serum albumin (BSA) were encapsulated in PLGA particles of two different diameters, 300 and 500 nm. The obtained SPIONs-PLGA nanocomposites exhibited superparamagnetic character, showed low cytotoxicity and were well taken up in macrophage and BM-DCs under an external magnetic field. In addition, the nanocomposites were tested for immune induction in BM-DCs. This combined SPION-PLGA carrier and an external magnetic field can significantly enhance BM-DC maturation by upregulating MHC II, CD80 and CD86 expression. Immune response induction by this strategy is verified through a significant upregulation of the IL-12 and IFN-γ production. Moreover, no activation of BM-DCs to secrete pro-inflammatory cytokine TNF-α was observed for all particles. We