

Accepted Manuscript

Title: Enhanced protein delivery by multi-ion containing eggshell derived apatitic-alginate composite nanocarriers

Author: T.S. Sampath Kumar K. Madhumathi B. Rajkamal S. Zaheatha A. Rajathi Malar S. Alamelu Bai



PII: S0927-7765(14)00523-2
DOI: <http://dx.doi.org/doi:10.1016/j.colsurfb.2014.09.052>
Reference: COLSUB 6653

To appear in: *Colloids and Surfaces B: Biointerfaces*

Received date: 15-4-2014
Revised date: 26-8-2014
Accepted date: 25-9-2014

Please cite this article as: T.S.S. Kumar, K. Madhumathi, B. Rajkamal, S. Zaheatha, A.R. Malar, S.A. Bai, Enhanced protein delivery by multi-ion containing eggshell derived apatitic-alginate composite nanocarriers, *Colloids and Surfaces B: Biointerfaces* (2014), <http://dx.doi.org/10.1016/j.colsurfb.2014.09.052>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Enhanced protein delivery by multi-ion containing eggshell derived apatitic-alginate composite nanocarriers

T.S.Sampath Kumar^{1,*}, Madhumathi K¹, Rajkamal B¹, Zaheetha S², Rajathi Malar A² and Alamelu Bai S²

1. Medical Materials Laboratory, Department of Metallurgical and Materials Engineering, Indian Institute of Technology, Madras, Chennai 600 036, India.

2. Department of Biochemistry, Asan College of Arts and Science, Chennai 600100, India.

*Corresponding author: tssk@iitm.ac.in; Tel.: +91 4422574772; Fax: +91 4422570545.

Abstract

Eggshell is an attractive natural source of calcium for the synthesis of hydroxyapatite (HA) as it contains minor amounts of biologically relevant elements such as Mg, Sr, and Si. The mineral phase of the human bone is essentially a calcium deficient hydroxyapatite (CDHA) which shows more bioactivities and absorbance than stoichiometric HA does. Hence, we have attempted to develop a protein delivery system based on eggshell derived CDHA (ECDHA) nanoparticles for bone tissue engineering. Nanoparticles with Ca/P molar ratio of 1.67, 1.61 and 1.51 to form CDHAs with compositions covering the properties of stable HA phase (Ca/P=1.67) to degradable tricalcium phosphate (TCP) phase (Ca/P=1.5) were synthesized by microwave-accelerated wet chemical synthesis using eggshell as well as synthetic calcium hydroxide as calcium precursors. The delivery profiles of bovine serum albumin (BSA), a model protein by the nanocarriers, were studied. Both eggshells derived and synthetic CDHA samples showed maximum amount of loading of 57% and 37% respectively at a Ca/P ratio of 1.51, comparing to stoichiometric HA. ECDHA also showed a much more BSA release (25%) than synthetically derived CDHA (6.5%) did. To further improve the release profile, alginate coating was carried out on CDHA nanoparticles and the BSA release profiles were evaluated. A maximum release of 65% was observed for alginate coated ECDHA at a Ca/P ratio of 1.51 for a period of 2 days. The ECDHA nanoparticle with a Ca/P ratio similar to degradable TCP and with alginate coating seems to be an ideal protein delivery agent.

Download English Version:

<https://daneshyari.com/en/article/599525>

Download Persian Version:

<https://daneshyari.com/article/599525>

[Daneshyari.com](https://daneshyari.com)