Iranica Journal of Energy & Environment 2 (1): 87-91, 2011
ISSN 2079-2115
IJEE an Official Peer Reviewed Journal of Babol Noshirvani University of Technology

BUT

Applying the Taguchi Method for Optimized Fabrication of "-Lactalbumin Nanoparticles as Carrier in Drug Delivery and Food Science

[1]Rabeah Mehravar, [2]Mohsen Jahanshahi,
[2]Ghasem D. Najafpour and [1]Naser Saghatoleslami

[1]Faculty of Chemical Engineering, Ferdowsi University of Mashhad, Mashhad, Iran
[2]Faculty of Chemical Engineering, Nanotechnology Research Institute,
Babol University of Technology, Babol, Iran

(Received: February 18, 2011; March 1, 2011)

Abstract: Protein nannoparticles fabrication as well as characterization have been extensively studied in our previous works as suitable carrier for drug delivery and food science, since they are biodegradable, non-toxic and non antigenic. The objective of the present study was to optimize the fabrication of "-lactalbumin nanoparticle by applying the Taguchi robust method which is a statistical approach to overcome the limitation of the factorial and fractional factorial experiments. The process variables were pH, temprature and agitation speed. The optimal levels of the different factors for the nanoparticle production based on coacervation method were pH 2.5, temperature 50°C and 750 rpm for agitation speed. The nanoparticle size at the determined condition was less than 220 nm. The mechanistic of the optimum conditions for preparing "-lactalbumin nanoparticles and their characterization as a drug delivery vehicles are strongly discussed.

Key words: "-lactalbumin % Nanoparticles % Drug carrier % Optimization % Taguchi method

INTRODUCTION

Although, the drug delivery system (DDS) concept is not new, great progress has recently been made in the treatment of a variety of diseases. Targeting delivery of drugs to the diseased lesions is one of the most important aspects of DDS and controlled drug delivery technology represent one of the frontier areas of science, which involves multidisciplinary scientific approach, contributing to human health care. These delivery systems offer numerous advantages compared to conventional dosage forms, which include improved efficiency, reduced toxicity and improved patient compliance and convenience. To convey a sufficient dose of drug to the lesion, suitable carrier of drug is needed [1]. Nanoparticles (NPs) have been developed as an important strategy to deliver conventional drugs, recombinant proteins, vaccines and more recently nucleotides. Nanoparticles and other colloidal drug delivery systems modify the kinetics, body distribution and drug release of an associated drug. Other effects are tissue or cell specific targeting of drugs and the reduction of unwanted side effects by a controlled release [2].

Polymeric nanoparticles have attractive physicochemical properties such as size, surface potential, hydrophilic-hydrophobic balance etc. and for this reason they have been recognized as potential drug carrier for bioactive ingredient such as anticancer drugs, vaccines, oligonucleotides, peptides, etc [3,4].

Among colloidal systems those based on proteins may be very capable. Proteins are a class of natural molecules that have unique functionalities and potential applications in both biological as well as material fields [5].

In spite of successful elaboration of many synthetic polymers as delivery systems, these cannot be used in food applications that require compounds which are generally recognized as safe (GRAS). Food biopolymers, specifically food proteins are widely used in formulate food because they have high nutritional value and are generally recognized as safe.

Clear advantages of food protein matrices include their high nutritional value, abundant renewable sources and acceptability as naturally occurring food components degradable by digestive enzymes.

Corresponding Author: Mohsen Jahanshahi, Faculty of Chemical Engineering, Nanotechnology Research Institute, Babol University of Technology, Babol, Iran, Tel/Fax: +98-111-3220342, E-mail: mjahan@nit.ac.ir.