REVIEW

Factors Affecting the Synthesis of Bovine Serum Albumin Nanoparticles Using the Desolvation Method

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Abstract: Currently, protein-based nanoparticles are in high demand as drug delivery systems due to their exceptional qualities, including nontoxicity, nonantigenicity, and biodegradability. Other qualities include high nutritional value, abundance of renewable resources, excellent drug binding capacity, greater stability during storage and in vivo, as well as ease of upgrading during manufacture. Examples of protein suitable for this purpose include ovalbumin (OVA) derived from egg white, human serum albumin (HSA), and bovine serum albumin (BSA). To create albumin nanoparticles, six different processes have been investigated in depth and are frequently used in drug delivery systems. These included desolvation, thermal gelation, emulsification, NAB technology, self-assembly, and nanospray drying. Several experimental conditions in the synthesis of albumin nanoparticles can affect the physicochemical characterization. Therefore, this study aimed to provide an overview of various experimental conditions capable of affecting the physicochemical characteristics of BSA nanoparticles formed using the desolvation method. By considering the variation in optimal experimental conditions, a delivery system of BSA nanoparticles with the best physicochemical characterization results could be developed.

Keywords: bovine serum albumin, BSA, desolvation, experimental conditions, physicochemical characteristics

Introduction

In recent decades, nanotechnology, particularly, the use of nanoparticles is reported to have transformed the therapeutic process, leading to more potent medicines, diminished adverse effects, and intelligent therapeutics capable of targeting disease areas.[1,2] Nanoparticles, defined as solid or liquid colloidal particles with a size ranging from 10 to 1000 nm offer various benefits, including the administration route and the enhancement of the therapeutic impact. Therefore, this nanotechnology is more advanced and extensively explored by various studies.[3] Nanoparticles can be constructed from synthetic or natural macromolecules and must be biocompatible or preferably biodegradable.[4]

Due to their exceptional qualities, including nontoxicity, nonantigenicity, biodegradability, high nutritional value, abundant renewable sources, extraordinary drug binding capacity, greater stability during storage and in vivo, alongside ease of scaling up during manufacture, protein-based nanoparticles have attracted significant interest as drug delivery devices.[5] The main objective of designing protein-based nanoparticles as a drug delivery system is to regulate the particle size, surface area, and characteristics. This ensures that nanoparticles system carries the necessary amount of drug and releases the active substance to achieve part-specific action and the desired pharmacological activity.[6] Since 2008, numerous studies have focused on the use of protein as drug delivery in the form of nanoparticles.[1] One example of protein suitable for this purpose is albumin,[4] which has unique features making it an ideal choice as a drug transporter. For instance, given the abundance in the