Research Article **CODEN: IJRPJK** **ISSN: 2319 – 9563**

International Journal of Research in Pharmaceutical and Nano Sciences

Journal homepage: **www.ijrpns.com**

PREPARATION OF ULTRA-FINE SIZED BSANPs BY USING BUTANOL TOLUENE DESOLVATION METHOD

Kirti Rani[*1]

[1*]Amity Institute of Biotechnology, Amity University, Sec-125, Gautam Buddha Nagar, Noida-201303, Uttar Pradesh, India.

ABSTRACT

Bovine serum albumin nanoparticles (BSANPs) are safe and biocompatible biocarrier systems used for site specific drug delivery. BSANPs are going to be used as the standard low-cost and safe nanobiomaterials for improved drug loading capacity for loaded bioactive molecules. Size controlling of BSANPs is very crucial step that make these NPs more safe and potent nanobiovehicles to get controlled and sustained targeted drug delivery. In this work, BSANPs were prepared by modified desolvation process using butanol-toluene to get most controllable particle size at nanoscale. DLS (Dynamic Light Scatting) was used to characterize the purity and size distribution of the prepared BSANPs. The prepared BSANPs were found to attained size range from 10 nm to 20 nm with exhibited diameter up to 12 nm and width of 0.9 nm which are observed to have the best narrow size distribution at nanoscale considerations. Hence, this proposed desolvation method can be a safe and low-cost technology to prepare ulta-fine sized BSANPs and diameter which may prove effective drug and gene delivery nonviral vehicles.

KEYWORDS

Bovine serum albumin nanoparticles, BSANPs Desolvation and Dynamic Light Scattering (DLS).

Author for correspondence:

Kirti Rani,

Amity Institute of Biotechnology,

Amity University, Sec-125, Gautam Buddha Nagar, Noida-201303, Uttar Pradesh, India.

Email: krsharma@amity.edu

INTRODUCTION

These days, BSANPs have attracted scientific attention to carrying most influential and effective targeted drug delivery. In last decade, BSANPs had been prepared by couple of delsovation methods to control their size distribution at nanoscale level. Previously, BSANPs were prepared by desolvation method followed by glutaraldehyde fixation or heat denaturation. The prepared nanoparticles were found in spherical shape with an average diameter of 492 nm. Rhoda mine B was loaded in to these nanoparticles and administrated in guinea pigs to investigate their drug loading capacity and release

behaviour[1]. The attaining narrow size distribution by prepared BSANPs is of major interest that may affect their bioavailability and cytotoxicity in host cell when administrated with desired drug. Bovine serum albumin (BSANPs) nanoparticles were prepared by modified desolvation method and calcium (Ca)-loaded BSA nanoparticles were fabricated at the targeted sizes ranging from 100 to 800 nm with diameters ranging from 125 to 713 nm. The size and the surface-area-to-volume-ratio of the Ca loaded BSA nanoparticles were controlled by adjusting BSA concentration, pH, and NaCl content that play more useful parameter to get their more effectiveness as compared to their mean diameter[2]. Other hydrid-colloidal albumin had been prepared with Chitosan Gelatin Sodium alginate, synthetic polymers include Polylactides (PLA), Polyglycolides (PGA), Poly (lactideco-glycolides) (PLGA), Polyanhydrides, Polyorthoesters, Polycyanoacrylates, Polycaprolactone, Poly glutamic acid, Poly(N-vinyl pyrrolidone), Poly (methyl methacrylate. These were considered as potential carriers for site specific drug delivery when chosen for encapsulation of drugs and enzymes[3]. Nanotechnology-driven biocatalysts have most promising key role in immobilization of any chemical and biological components on various potential biocompatible nanomaterials for excellent particle mobility[4,5]. Other nanotechniques had been used to prepare BSANPs which are named, desolvation, emulsification, thermal gelation, coacervation, nano-spray drying, nab-technology and self-assembly that have been investigated for fabrication of albumin nanoparticles[5,6]. Albumin nanospheres were also knows as best nonviral carriers for passive drug targeting having ease of an optimized manufacturing technique with more advanced characterization methods[7,8]. BSANPs were also synthesized by desolvation to control their size, diameter and width to attain narrow size distribution with the size of 100 to 300 nm[9]. As well as, synthesis and characterization of various fabricated BSANPs were also carried out by using modified emulsification[10-14] and desolvation[15] nanotechniques[10-15].

Hence, this proposed nanotechnology was designed to synthesis of very small and uniform sized BSANPs by using modified butanol-toluene desolvation method when characterized by DLS. This method is found to be rapid, easy and low-cost method that can be used as non-toxic drug/ gene delivery nonviral drug or gene bound BSANPs. And, it may have potential clinical applications in the field of regenerative medicine, nanomedicine and molecular medicine.

MATERIAL AND METHODS

Preparation of BSANPs by Butanol-Toluene Desolvation method

BSANPs were prepared by desolvation method given by Sailaja A. *et al*, 2012[6] Rani, K., 2015[12] and Rani K and Chauhan C, 2015[18] with slight modifications. Drop wise addition of 2-3ml of n-butanol was done into prepared 2-5% of BSA solution kept under the magnetic stirrer till the formation of opalescent suspension. After this, 4-5ml of toluene was added and activated reaction solution was kept overnight with continuous stirring. The reaction solution was centrifuged at 5000 rpm at 4^0C for 20mins. The, it was dispersed it in chilled acetone and subjected to sonication to keep it in bath sonicator for 30-35 minutes[12,18].

Characterization of Prepared BSANPs by Dynamic Light Scattering (DLS) Method

The prepared BSANPs were subjected to Scanning Electron Microscopy (SEM) for the interpretation of their nanosize distribution with exhibited particle size and diameter[1,10,12-18].

RESULTS AND DISCUSSION

Characterization of Prepared BSANPs by Dynamic Light Scattering (DLS) Method

Characterization of Prepared BSANPs was done with Dynamic Light Scattering (DLS) Method to assign their size distribution (Figure No.1). Prepared BSANPs have exhibited sharp single DLS peak in-between 10 nm to20 nm which confirmed the purity and uniform nanosize of prepared BSANPs by using butanol-toluene deslovation method. DLS result of prepared BSANPs was found to be observed their exhibited diameter of 12.93 nm

and width of 0.9382 (Figure No.1). These DLS observations of prepared BSANPs were found to be better than the previous DLS studies[1,2,10-18].

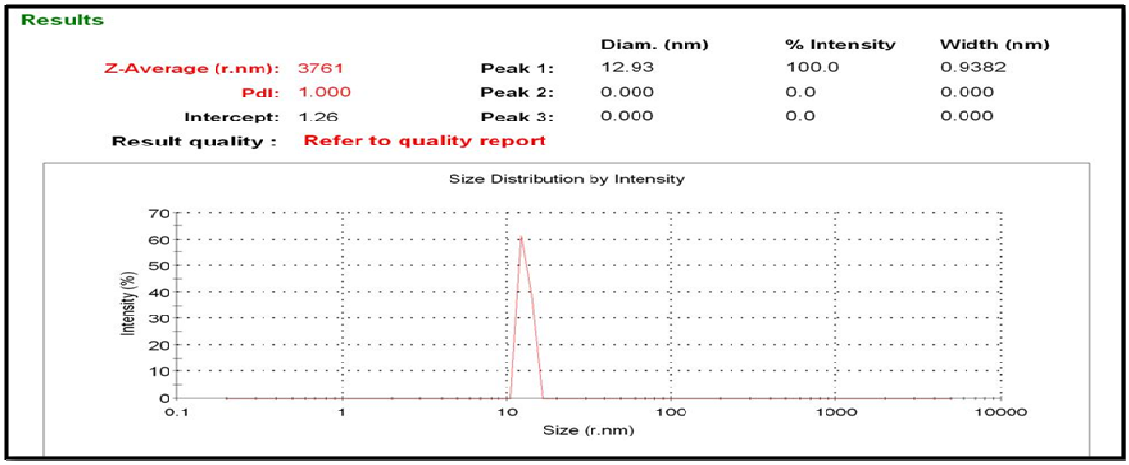

Figure No.1: DLS of BSA NPs by using Butanol-Toluene Deslovation method

CONCLUSION

Hence, form this brief study, it was concluded that Butanol-Toluene Desolvation method was more efficient method to synthesize ultra-fine nanosized BSANPs of 10-20nm with diameter of 12.93 nm and width of 0.9382 nm. This modified nanotechnology can be proved easy and low-cost alternative over other costly and tedious chemical methodologies. It can be further subjected to more innovative advancements and can be used to prepare low-cost and rapid BSANPs having very nanosize distribution at large scale and further employed for targeted drug and gene delivery.

ACKNOWLEDGEMENT

The authors are highly thankful to Amity Institute of Biotechnology, Amity University, Sec-125, Gautam Buddha Nagar, Noida-201303, Uttar Pradesh, India for providing all the facilities to carry out this work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

REFERENCES

1. Yu Z, Yu M, Zhang Z, Hong G, Xiong Q. Bovine serum albumin nanoparticles as controlled release carrier for local drug delivery to the inner ear, *Nanoscale Research Letters*, 9(3), 2014, 343- 3512.
2. Jun J Y, Nguyen H N, Paik S Y R, Chun H S, Kang B C, Ko S. Preparation of size-controlled bovine serum albumin (BSA) nanoparticles by a modified desolvation method, *Food Chem*, 127(4), 2011, 1892-1898.
3. Nagavarma B, Hemant V N, Yadav K S, Ayaz A, Vasundhra L S, Shivkumar H G. Different techniques for preparation of polymeric nanoparticles- A review, *Asian J. Pharmaceutical Clin. Res*, 5(3), 2012, 16-23.
4. Wang P. Nanoscale Biocatalyst System, *Curr Opin Biotechnol*, 17(6), 2006, 574.
5. Rani K, Chauhan C, Kaur H. Potential and automotive applications of nanomaterials in combating cancer and stem cell therapy, An informative overview on nanotherapeutics, *J Nanotech Smart Materials*, 1(1), 2014, 1-6.
6. Sailaja A, Amareshwar P. Preparation of BSA Nanoparticles by Desolvation Technique Using Acetone as Desolvating Agent, *Int J Pharmaceutical Sci Nanotechnol*, 5(1), 2012, 1643-1647.
7. Elzoghby A, Samy W and Elgindy A. Albumin-Based Nanoparticles As Potential

Controlled Release Drug Delivery Systems, *Controlled Release*, 157(2), 2012, 168-182.

8. Muller G M, Leuenberger H, Kissel T. Albumin nanospheres as carriers for passive drug targeting: an optimized manufacturing technique, *Pharm. Res*, 13(1), 1996, 32-37.
9. Dubes A, Parrot-Lopez H, Abdelwahed W, Degobert G, Fessi H, Shahgaldian P, Coleman A. Scanning electron microscopy and atomic force microscopy imaging of solid lipid nanoparticles derived from amphiphilic cyclodextrins, *European J Pharmaceutics Bio pharmaceutics*, 55(3), 2003, 279-282.
10. Rohiwal S, Pawar, S H. Synthesis and characterization of bovine serum albumin nanoparticles as a drug delivery vehicle, *Int J Pharm Bio Sci*, 5(4)(B), 2014, 51-57.
11. Sharma K R. Preparation of emulsified encapsulated nanoparticles of bovine serumalbumin of bound glucose oxidase and their application in soft drinks/non-alcoholic beverages, *Biotechnol and Biomaterials*, 2(2), 2012, 1-4.
12. Rani K. Applicative biodegradation study of egg albumin nanospheres by alkaline protease for release of encapsulated cicer arietinum amylase in washing as bio-active detergent additive, *World J Pharmaceutical Res*, 4(1), 2015, 1-13.
13. Rani K, Goyal S and Chauhan C. Novel approach of alkaline protease mediated biodegradation analysis of mustard oil driven emulsified bovine serum albumin nanospheres for controlled release of entrapped *Pennisetum glaucum* (Pearl Millet) amylase, *Am J Advn Drug Delivery*, 3(2), 2015, 135-148.
14. Rani K, Gupta C, Chauhan C. Biodegradation of almond oil driven bovine serum albumin nanoparticles for controlled release of encapsulated Pearl millet amylase, *Am J Phytomedicine Clin Therapeutics*, 3(3), 2015, 222-230.
15. Rani K. Novel Biodegradation Analysis of Olive Oil Driven Emulsified Bovine Serum Albumin Nanopreparation with Alkaline Protease for Controlled Release of Encapsulated Pennisetum glaucum Amylase, *J Chem Chemical Sci*, 5(6), 2015, 341-350.
16. Rani K, Kant S. Alkaline Protease Mediated Bioproteolysis of Jasmine Oil Activated Pennisetum glaucum Amylase Loaded BSA Nanoparticles for Release of Encapsulated Amylase, *Int J Chem Sci and Appl*, 26(2), 2015, 56-63.
17. Rani K, Chauhan C. Biodegradation of Cicer Arietinum Amylase loaded Coconut oil driven Emulsified Bovine Serum Albumin Nanoparticles and their application in Washing Detergents as Eco-Friendly Bio-Active Addictive, *World J.Pharmacy Pharmaceutical Sci*, 3(12), 2014, 924-936.
18. Rani K, Chauhan C. Preparation of Cicer Artienium Amylase Loaded BSA Nanoparticles and Their Bioproteolysis to be used as Detergent Additive, *Bioengg and Biosci*, 3(5), 2015, 72-82.

Please cite this article in press as: Kirti Rani *et al*. Preparation of ultra-fine sized BSANPs by using butanol-toluene desolvation method, *International Journal of Research in Pharmaceutical and Nano Sciences*, 5(1), 2016, 35-38.