International Journal of Chemistry and Pharmaceutical Sciences

Journal Home Page: www.pharmaresearchlibrary.com/ijcps

Research Article **Open Access**

Synthesis of Egg Albumin Nanoparticles (EANPs) by Using Toluene Driven Modified Emulso-Desolvation Method

Kirti Rani*

Amity Institute of Biotechnology, Amity University Uttar Pradesh, Noida, Sec-125, Noida-201303, U.P, India.

A B S T R A C T

Egg albumin nanoparticles (EANPs) are previously reported a safe and biocompatible drug carrier systems to carry out improved targeted delivery. EANPs are also low-cost and safe nanomaterials to carry out more efficient drug loading capacity to load desired drug with high site specificity and low cytotoxicity and desired delivery rate at the targeted site. Size controlling of EANPs was also done by using various methods to make them more potent nonviral carriers to carry out controlled and sustained targeted delivery of the respective biological and chemical components that bind in to them by Nanotechnology Albumin Binding Technology (nab technology). In this designed work, EANPs were prepared by using toluene driven modified emuslo-desolvation method to achieve more controllable particle size at nanoscale. DLS (Dynamic Light Scatting) was assigned to characterize the size distribution of the prepared EANPs. The prepared EANPs were found to attained size ranging from 0.5 nm to 11 nm with exhibited diameter up to 365.8 nm and width of 60.50 nm which are observed to attained narrow size distribution at nanoscale considerations. Hence, this toluene-butanol desolvation method can be used as safe and low-cost nanopractice to prepare nanosized EANPs that may further employed to carry out safe and potent drug and gene delivery as nonviral nano-therapeutic vehicles in various therapeutic applications which are going to be considered in the field of regenerative medicine, molecular medicine and nanomedicine.

Keywords: Egg albumin nanoparticles; EANPs; Emulso-Desolvation; Toluene; Dynamic Light Scattering (DLS)

A R T I C L E I N F O

CONTENTS

Article History: Received 21 January 2016, **Accepted** 24 February 2016, **Available Online** 27 March 2016

***Corresponding Author**
Kirti Rani
Amity Institute of Biotechnology,
Amity University Uttar Pradesh, Noida,
Sec-125, Noida-201303, U.P, India.
Manuscript ID: IJCPS2883

PAPER-QR CODE

Citation: Kirti Rani, *et al.* Synthesis of Egg Albumin Nanoparticles (EANPs) by Using Toluene Driven Modified Emulso-Desolvation Method. *Int. J. Chem, Pharm, Sci.*, 2016, 4(3): 115-117.

1. Introduction

These days, albumin nanoparticles have been considered by various researchers to study their delivery of various active pharmaceuticals compounds and drugs to get improved accumulation at the site of inflammation. These previous findings was explained that albumin was a effective versatile carrier to prepare nanoparticles and nanospheres due to its easy availability in pure form, biodegradability non-toxic and non-immunogenic characteristic.[1] Protein nanoparticles have been also recognized more potent nanocarriers to deliver low molecular-weight drugs, anticancer drug, DNA, vaccines, oligonucleotides and peptides. Recently, egg Albumin (EANPs) nanoparticle. These prepared EANPs were having suitable size/size distribution and good surface properties for drug delivery application by employing Taguchi method that was based on simple coacervation method along with optimization of the nanoparticles.[2] Carvedilol containing egg albumin nanoparticles were also synthesized by coaservation method using gluteraldehyde and ethanol. These results were showed that this method was reproducible, very easy and led to the efficient entrapment of drug as well as formation of spherical particles ranging from 500 nm to 1000 nm.

The maximum percentage drug entrapment and percentage yield were also depicted with effective sustained release behaviour of EANPs.[3] Due to defined nanoformulation of protein and albumin based nanoparticles are also offered various possibilities for safe and low-cost surface approach including covalent loading/ binding of drugs and tagging photoluminescent ligands to be considered as effective site specific nonviral tagted loading carrier used in cancer, tumor, neurodegenerative and spinomuscular diseases gene/drug therapy.[4] Previously, aceclofenac-loaded chitosan-egg albumin nanoparticles had been also prepared through heat coagulation method and characterized by FE-SEM, FTIR, DSC and P-XRD. Highest drug entrapment was reported with 352.90 nm average particle diameter and -22.10 mV zeta potential.[5]

Various nanotechnology-driven biocatalysts were also studied and found to be that they played promising key role in binding of desired chemical and biological components on to various activated potential biocompatible nanomaterials to carry out effective particle mobility [6] Other nanotechniques had been also employed to prepare and fabricated the fine sized EANPs by using desolvation, emulsification, coacervation, thermal gelation, nab-technology, nano-spray drying and self-assembly that have been studied to investigate their fabrication of albumin nanoparticles.[5,6] Albumin nanoparticles were also reported as more potent nonviral drug and gene vehicles for passive drug targeting with their good ease of using respective optimized manufacturing technique.[7,8]

EANPs were also synthesized by previously designed desolvation to control their size, diameter and width to attain narrow size distribution with the size of 100 to 300 nm.[8] Hybrid EANPs had been also successfully prepared to conjugate chitosan and these chitosan based nanoparticles were further used for delivery of proteins and peptides as low cost and nontoxic nonviral gene delivery vehicle.[9] Synthesis and characterization of other albumin NPs were also reported by using modified emulsification [10-17] and desolvation [7] nanotechniques. [10-16] Hence, this designed work was assigned to carry out the preparation of fine sized EANPs by using modified toluene driven modified emulso-desolvation method using toluene and coconut oil as emulsifier. They were further characterized by DLS. This modified toluene driven emulso-desolvation method was found to be easy and low-cost green alternative to prepare EANPs that can be used as effective and non-toxic drug/ gene delivery nonviral drug or gene bound EANPs. And, it can be further employed to carry out various potential therapeutic strategies which are used in regenerative medicine, nanomedicine and molecular medicine.

2. Experimental

Preparation of EANPs by Toluene driven modified Emulso-Desolvation method

EANPs were prepared by toluene-butanol desolvation method given by Rani, K. & Chauhan, C., 2015[7] and Rani, K., 2015[12] and with slight modifications. Oil bath was prepared with a solution of 4-5ml of toluene and 25 ml of coconut oil. Then, 8-10 ml of egg albumin solution was taken in a 10 gauge syringe and dispersed in prepared oil bath. This activated oil bath was kept overnight in incubator shaker at 37°C. Next day, it was centrifuged at 5000rpm at 4°C for 20 minutes. After this, 4-5ml of diethyl ether and was added and activated reaction solution was sonicated for 30-40 minutes. The reaction solution was again centrifuged at 5000 rpm at 40C for 20mins. Then, add 3-5 ml of butanol and subjected to sonication for 30-40 minutes. After that, reaction solution was again centrifuged at 5000 rpm at 40C for 20mins. Then, it was again dispersed in chilled acetone and subjected to sonication to keep it in bath sonicator for next 30-35 minutes [7,12]

Characterization of Prepared EANPs by Dynamic Light Scattering (DLS) Method: The prepared EANPs were characterized by using Dynamic Light Scattering (DLS) Method to determine their nanosize distribution with exhibited particle size and diameter.[1,2,7,11-16]

3. Results and Discussion

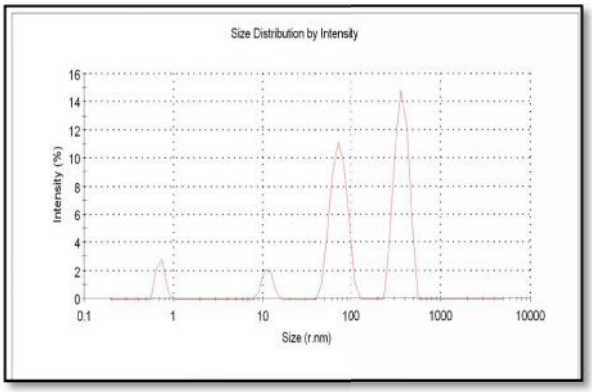

Figure 1: DLS of EANPs by using Toluene driven Modified Emulso-Desolvation method

Characterization of Prepared EANPs by Dynamic Light Scattering (DLS) Method: Characterization of Prepared EANPs was done with Dynamic Light Scattering (DLS) Method to interpret their size distribution (Fig 1). Observed first two DLS peaks was depicted the exhibited nano-sized prepared EANPs in-between 0.5 nm to 1 nm (First Peak) and 0.8 nm to 11 nm with exhibited diameter up to 365.8 nm and width of 60.50 nm followed by another two peaks relative to particle size distribution shown by another mixed competitive particles (Fig 1). This DLS observation of prepared EANPs were found to be very comparable with previous findings.[1,2,5,7,12-16]

4. Conclusion

From this designed work, it was concluded that proposed Toluene driven modified Emulso-Desolvation method was easy and low-cost nanopractice to prepare fine nanosized EANPs of size ranging from 0.5 to 11 nm with exhibited diameter up to 365.8 nm and width of 60.50 nm. Hence, this designed modified desolvation nanopractice can be a easy, low-cost and green-herbal alternative over other costly and tedious chemical methods due to using coconut oil as affordable, natural occurring and antibactericidal emulsifier. It can be further improved to achieve desired poly disparity index of proposed EANPs to get more ultra-fine nanosized particles by varying differential centrifugation cycles, agitation and sonication cycles. And further, it may be consider at industrial scale and employed to carry out targeted drug and gene delivery.

5. References

[1] Kaur H, Sing A, Design, development and characterization of serratiopeptidase loaded albumin nanoparticles, J Applied Pharmaceutical Sci., 2015; 5(2): 103-109.

[2] Taheri ES, Jahanshahi and Mosavian MTH. Preparation, Characterization and Optimization of Egg Albumin Nanoparticles as Low Molecular-Weight Drug Delivery Vehicle. Particle & Particle Systems Characterization. 2012; 29(3): 211-222.

[3] Ankarao A, Naik VV and Rao HK. Formulation and In Vitro Evaluation of Oral Sustained Release Nanoparticulate Delivery System of Carvedilol. International Journal of research in Pharmaeutical and Biomedical Sciences. 2012, 3(2): 924-928.

[4] 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, 2012; 5(3): 16-23.

[5] Jana S, Manna S, Nayak AK, Sen KK and Basu SK. Carbopol gel containing chitosan-egg albumin nanoparticles for transdermal aceclofenac delivery. Colloids Surf B Biointerfaces. 2014, 1, 114: 36-44. doi: 10.1016/j.colsurfb.2013.09.045.

[6] 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, 2014; 1: 1-6.

[7] Rani K, Chauhan C, Preparation of Cicer Artienium Amylase Loaded BSA Nanoparticles and Their Bioproteolysis to be used as Detergent Additive, Bioengg and Biosci., 2015; 3(5): 72-82.

[8] Elzoghby A, Samy W and Elgindy A, Albumin-Based Nanoparticles As Potential Controlled Release Drug Delivery Systems, J Controlled Release., 2012; 157(2): 168-182.

[9] Mohanraj VJ, Chen Y and Suresh B. Chitosan based nanoparticles for delivery of proteins and peptides. Ind J PharmSci. 2006; 40(2): 106-110.

[10] Sharma K R, Preparation of emulsified encapsulated nanoparticles of bovine serum albumin of bound glucose oxidase and their application in soft drinks/non-alcoholic beverages, Biotechnol & Biomaterials., 2013, 2(2): 1-4.

[11] 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, 2015; 4(1): 1-13.

[12] 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., 2015, 3(3): 222-230.

[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. 2015, 3(2): 135-148.

[14] 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., 2015; 26(2): 56-63.

[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., 2015; 5(6): 341-350.

[16] 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., 2014; 3(12): 924-936.