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PREPARATION OF BSANPS BY USING MODIFIED EMULSO-DESOLVATION METHOD

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ABSTRACT

Bovine serum albumin nanoparticles (BSANPs) are considered safe and biocompatible biocarrier systems which are used for effective tragetted delivery carriers. BSANPs are also have standard low-cost and safe nanobiomaterials for improved drug loading capacity for loaded bioactive molecules with high site specificity and low cytotoxicity. Size controlling of BSANPs by using improved and modified methods is noted to be a crucial step that make BSANPs more potent nonviral nanovehicles to get controlled and sustained targeted drug delivery when these are proposed to be bind with other desired components by using Nanotechnology Albumin Binding Technology (nab technology). In present work, BSANPs were prepared by modified emulso-desolvation process using coconut oil and toluene to get most controllable particle size at nanoscale. DLS (Dynamic Light Scatting) was used to characterize the size distribution of the prepared BSANPs. The prepared BSANPs were found to attained size range from 8 nm to 10 nm with exhibited diameter up to 269.2 nm and width of 158.4 nm which are observed to attained good narrow size distribution at nanoscale considerations. Hence, this proposed emulso-desolvation method can be a safe and low-cost technology to prepare fine sized BSANPs and diameter which may prove more potent drug and gene delivery carriers.

KEYWORDS: Bovine serum albumin nanoparticles; BSANPs; Emulso-Desolvation; Coconut oil; Dynamic Light Scattering (DLS).

INTRODUCTION

BSANPs have attracted many scientific attentions worldwide to carrying most potential and effective site-specific drug and gene delivery. In past decade, albumin nanoparticles have been studied for delivery of various active pharmaceuticals compounds and drugs with enhanced accumulation at the site of inflammation. Albumin was found to be a quite effective versatile carrier to prepare nanoparticles and nanospheres due to its easy availability in pure form, biodegradability non-toxic and non-immunogenic characteristic.[1] Preparation of narrow sized BSANPs has been depicted a major interest that may affect bioavailability and cytotoxicity in host cell when administrated with desired compounds. Bovine serum albumin (BSANPs) nanoparticles were synthesized by modified desolvation method and calcium (Ca)-loaded BSA nanoparticles and 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 BSANPs 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 nanoparticles had been prepared with Chitosan Gelatin Sodium alginate, synthetic polymers include Polylactides(PLA), Polyglycolides(PGA), Poly(lactide co-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 loading of required drugs and enzymes.[3] BSANPs had been prepared by couple of desolvation methods to control their size distribution at nanoscale level and done by glutaraldehyde fixation or heat denaturation. The prepared nanoparticles were exhibited spherical shape with an average diameter of 492 nm. Rhodamine B was formulated to be loaded in to prepared nanoparticles and administrated in guinea pigs to investigate their drug loading capacity and release behaviour.[4] Nanotechnology-driven biocatalysts were played a promising key role in binding of any chemical and biological components on to various activated potential biocompatible nanomaterials for excellent particle mobility.[5] Other nanotechniques had been used to prepare BSANPs such as 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 nanoparticles were also know as potential nonviral nanocarriers for passive drug targeting having ease of an optimized manufacturing technique.[7,8] BSANPs were also prepared by desolvation to control their size, diameter and width to attain narrow size distribution with the size of 100 to 300 nm.[9] Hybrid BSANPs had been successfully used as cationic bovine serum albumin based self-assembled hybrid-nanoparticles called, siRNA delivery vector. And, it was used to treat lung metastatic cancer as low cost and nontoxic nonviral gene delivery vehicle.[10] Previously, synthesis and characterization of various fabricated BSANPs were also done by using modified emulsification[11-17] and desolvation[18] nanotechniques.[10-17]

Hence, this proposed nanopractice was designed to synthesis of very small and uniform sized BSANPs by using modified emulso-desolvation method using coconut oil and toluene and characterized by DLS. This method was found to be easy and low-cost method that can be used as non-toxic drug/ gene delivery nonviral drug or gene bound BSANPs. As well as, it may have potential therapeutic applications in regenerative medicine, nanomedicine and molecular medicine.

MATERIALS AND METHODS

Preparation of BSANPs by Emulso-Desolvation method

BSANPs were prepared by emulso-desolvation method given by Sailaja, A. *et al.*, 2012[6]; Rani, K., 2015[13] and Rani, K. & Chauhan, C., 2015[19] with slight modifications. Oil bath was prepared with a solution of 2.6 ml of n-butanol, 4-5ml of toluene and 25 ml of coconut oil. Then, 2-5% of bovine serum albumin 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. The, it was dispersed it in chilled acetone and subjected to sonication to keep it in bath sonicator for 30-35 minutes.[13,19]

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

The prepared BSANPs were characterized by using Dynamic Light Scattering (DLS) Method for the interpretation of their nanosize distribution with exhibited particle size and diameter.[1,9,10,13-19]

RESULT 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 determine their size distribution (Fig 1). Exhibited sharp first DLS peak was noticed and exhibited ulta-fine sized of prepared BSANPs in-between 8 nm to 10 nm with exhibited diameter up to 269.2 nm and width of 158.4 nm followed by another two peaks relative to particle size distribution of other mixed competitive particles (Fig 1). This DLS result of BSANPs were found to be comparable with previous DLS interpretations.[1,9,11-19]

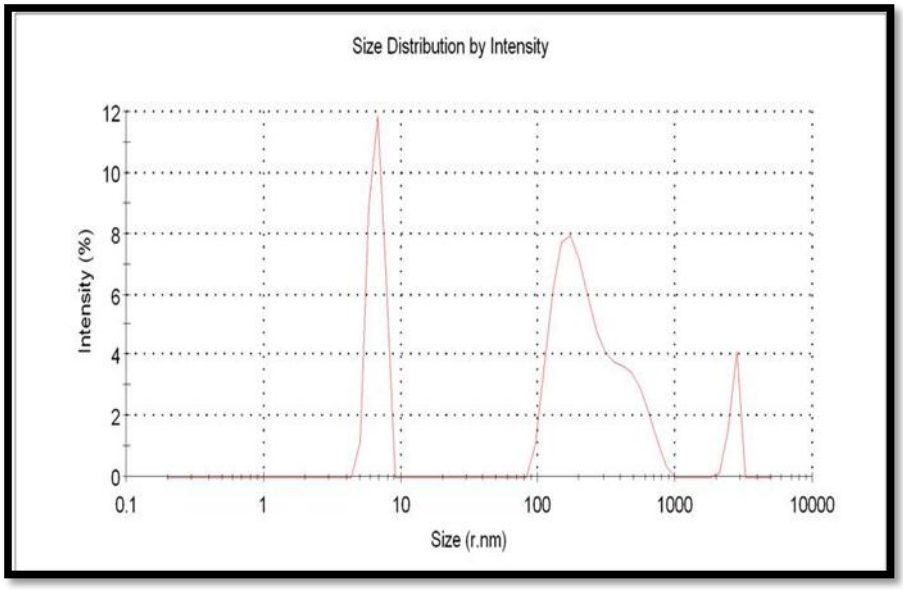

Fig 1: DLS of BSANPs by using Emulso-Desolvation

CONCLUSION

From this study, it was concluded that Emulso-Desolvation method was effective and green alternative method to synthesize ultra-fine nanosized BSANPs of between 8 nm to 10 nm with exhibited diameter up to 269.2 nm and width of 158.4 nm. This modified emulso-desolvation nanopractice can be proved green, easy, low-cost and herbal alternative over other costly and tedious chemical methodologies because of using coconut oil which is itself a natural occurring antibactericidal emulsifying agent. So, it can be further improved by subjecting to differential centrifugation cycles, agitation

and sonication cycles to achieve its best poly disparity index to get more ulta-fine nanosized BSANPs at industrial scale and further employed for targeted drug and gene delivery systems.

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