Human Serum Albumin (HSA) Nanoparticles Fabrication and Optimization of the Particle Size by Taguchi Robust Design Method for Delivery of Anti-Cancer Drug

In the past three decades, considerable research interest has arisen worldwide in the development of new colloidal drug delivery systems. The ideal colloidal delivery system would transport the associated drug to its desired site of action and then release it at an optimum rate. Nanoparticle using serum albumins represent an attractive strategy, since they combine a high drug loading capacity with minimal tissue irritation and toxic effects. HSA is a promising material and was used in a multitude of studies for particle preparation. Particle size is a crucial parameter, in particular for the in vivo behavior of nanoparticles after intravenous injection. The objective of the present study was production of HSA nanoparticle by desolvation method and optimization of nanoparticle by applying the Taguchi method. The process variables were pH, HSA concentration, agitation speed, glutaraldehyde concentration, organic solvent adding rate and the ratio of organic solvent/HSA solution. The optimal levels of the different factors for nanoparticle production were pH 9,75 $mg.ml^{-1}$ HSA concentration, ratio of organic solvent/HSA solution of 4 and organic solvent adding rate of $1.5ml.min^{-1}$. As the result of Taguchi analysis in this study, pH and ratio of organic solvent/HSA solution were the most influencing parameter on the particle size. The minimum size of nanoparticles (53nm) was obtained with using Taguchi method which is suitable for drug delivery. Nanoparticles analyzed by photon correlation spectroscopy (PCS), scanning electron microscopy (SEM) and atomic force microscopy (AFM). Based on these characteristics, HSA nanoparticles were good enough to be candidate for drug delivery.
Key word: Drug delivery; human serum albumin; nanoparticle