Synthesis, Characterization and Drug- loading Behavior of Novel Anticancer Drug Carrier, Cationic Albumin Conjugated Superparamagnetic Iron Oxide Nanoparticles

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Abstract

A novel anticancer nano-magnetic drug carrier, cationic albumin conjugated superparamagnetic iron oxide nanoparticle (SPION), with high loading capacity of methotrexate (MTX) was developed .SPIONs were synthesized by co-precipitation of II and III iron ions in an alkaline solution [1]. Citric acid was selected to provide stability of SPION. Carboxylic acid terminal group provides a site for further surface modification [2]. Afterwards, the SPIONs were covalently modified by cationic albumin using carbodiimide chemistry [3]. Human serum albumin was cationized by substituting anionic side chain carboxyl groups with amine groups. Cationization is an approach that can be used for targeted drug delivery, because of negative charge of cell surface membrane, so this surface charge provides sites of interaction for cationic particles. Finally MTX attached into cationic albumin conjugated SPIONs by entrapping negatively charged drug onto positively charged nanoparticles through electrostatic interactions, to target MTX onto tumor environment [4]. The obtained nanoparticles were characterized by XRD, TEM, SEM, FTIR, SDS-PAGE, Bradford assay, VSM, zeta potential and HPLC analysis, proved stepwise modification of SPIONs with citric acid and cationic albumin and MTX. The present finding show that cationic albumin conjugated SPIONs could be loaded high amount of chemotherapeutic agents (e.g. methotrexate) and encouraging carrier for magnetically targeted drug delivery.

Key worlds:

Iron oxide nanoparticle, Citric acid, Cationic albumin, Methotrexate, Targeted delivery

References

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Figures

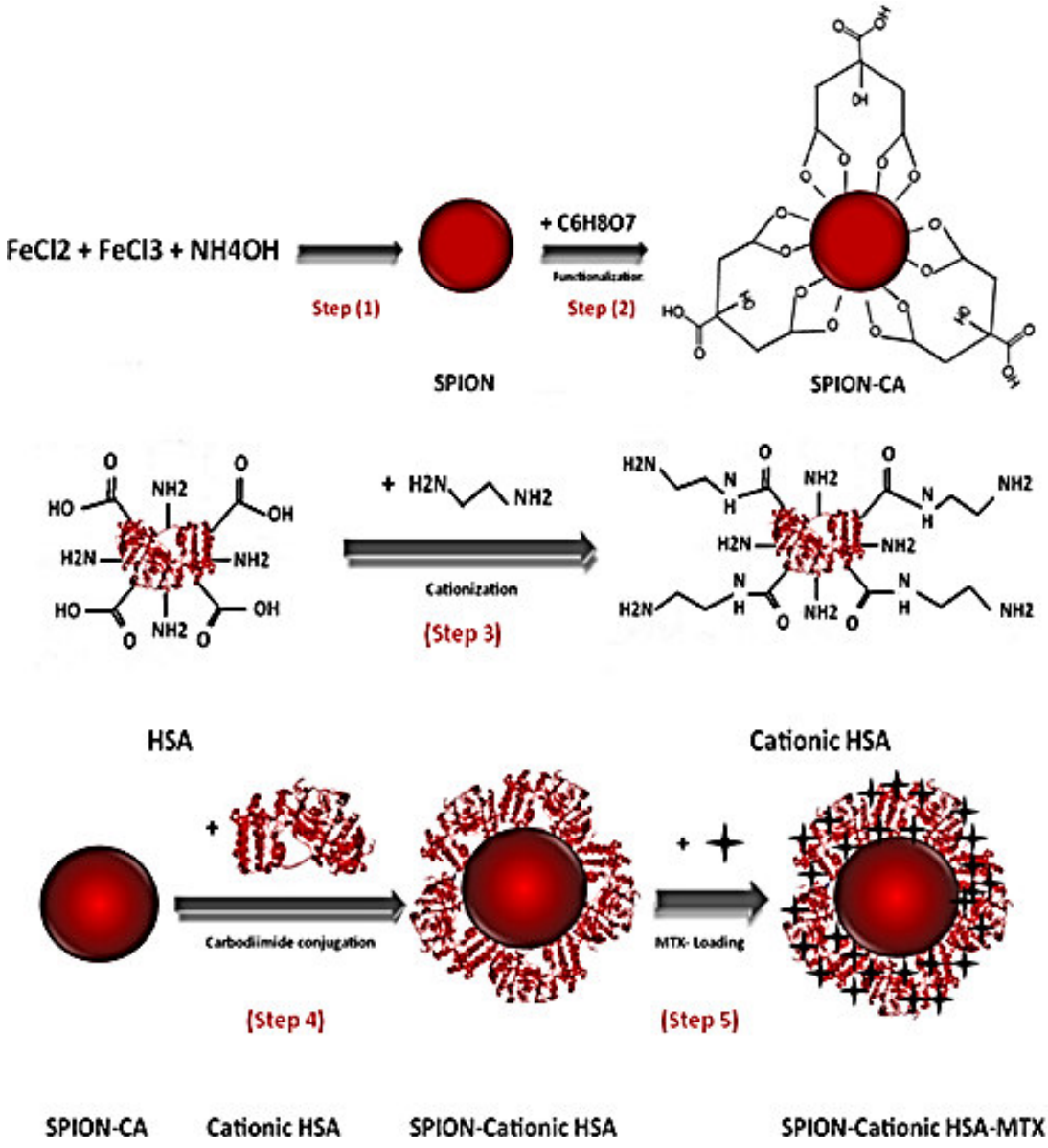

Fig.1. Scheme for the functionalization procedure of superparamagnetic iron oxide nanoparticles (SPION) described**.** Step 1 shows preparation of SPION, step 2 stabilization of SPION with citric acid (CA), step 3 preparation of cationized human serum albumin (HSA) by ethylenediamine, step 4 conjugation of cationic albumin onto SPION-CA and step 5 loading of Methotrexate on SPION conjugated cationic albumin