Characterization of bis(indolyl) methane dye loaded human and bovine serum albumins immobilized magnetic nanoparticles for drug delivery systems

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Introduction

Nanoparticles are one of the most interesting materials in different areas of life. The capability of targeting specific locations in the body, reduction in the amount of drug needed to achieve a certain concentration in targeted diseased area and reduction in concentration of the drug at non-target sites minimizing side effects, are some advantages of drug delivery systems based on the use of nanoparticle [1]. Surface functionalized, superparamagnetic iron oxide nanoparticles (SPIONs), became more and more fascinating due to an increasing variety of biological applications such as targeted drug/gene delivery, magnetic resonance imaging, bio-separation, tissue repair, and thermal tumor therapy [2]. Serum albumins are large multimeric all-helical plasma proteins that are the most abundant proteins in plasma. They are responsible for transport of small molecules such as metals, hormones, fatty acids, and drugs to specific tissues, regulate ionic pressure, maintain blood pH, and as a predominants plasma antitoxins [3]. Albumin immobilized nanoparticles have several specific advantages which biodegradability, easy preparation and reproducibility are among them. In a non-toxic magnetic nanocarrier system, that is ubiquitous in many biological systems commonly found in nature. This class of compounds has shown wide range of applications in medicinal and many other areas of chemistry. Bisindolylmethanes (BIM) are indole derivatives that display diverse biological properties. They are of immense interest because of their pharmacological properties, such as inhibitory activities against cancer cells (bladder cancer, renal cell carcinoma, lung cancer, colon cancer, mammary tumor, breast tumor, prostate cancer cell lines, etc.), antibacterial activity, amniontropic activity, and acting as cytotoxic agents [5]. In this work, superparamagnetic iron oxide nanoparticles (SPIONs) were prepared by the chemical co-precipitation of Fe3O4 and Fe5O4 ions.

Synthesized nanoparticles were modified by aminefunctionalized agent (APTES) and then the amine-functionalized magnetic SPIONs were used as trichloroethylen (TCT). Human and bovine serum albumins were bonded covalently to activated nanoparticles. Then, albumin immobilized SPIONs were reacted with BIM (Scheme 1) as an anticancer drug.

References