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Study of Cytotoxicity Properties of Functionalized Mesoporous Silica Nanoparticles on Different Cell Lines

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Recently, applications of mesoporous silica nanoparticles (MSNs) in drug delivery systems have been increased. Inorder to improvement of surface properties and increase drug loading, surface of this MSNs could be modified by suitable functional groups. The aim of this work was to synthesis amino functionalized mesoporous silica nanoparticles by triethoxyorthosilan (APTES) and comprehensive study about their cytotoxicity. Synthesized nanoparticles were characterized by TEM, SEM, XRD and N₂ adsorption analysis. Cytocompatibility is one of the primary concerns in the use of these functionalized mesoporous silica nanoparticles as nanocarriers for drug delivery applications. In this, work functionalized mesoporous silica nanoparticles (AP-MSNs) were synthesized and cytotoxicity of AP-MSNs inside the MCF-7, Caco-2 and SY5Y cells, was investigated. Based on obtained results, AP-MSN showed no significant toxicity effect on MCF-7, Caco-2 and SY5Y cell lines.

Keywords: Nanoparticle; Mesoporous silica; Functionalization; Cytotoxicity; APTES

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The Synthesized Fe₃O₄-CMC-Genistein Nano-Conjugate Improved its Toxicity on Hematopoietic Cancer Cell in Lower Dose

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With development of nanotechnology in medicine, magnetic nanoparticles are widely used for therapeutic and diagnostic objectives, because of their biocompatibility, ease of preparation and magnetic properties. Genistein (C15H10O5) is a soy isoflavone which is used for its anti-cancer activities. It is used for inhibition of cell proliferation and tumor invasion. The aim of this study is to assess the impact of nano-conjugation of geinstein as chemotherapeutic agent against cancer. For preparation of typical iron oxide nanoparticles, Magnetite nanoparticles were synthesized by coprecipitating iron (II) chloride and iron (III) chloride in alkaline solution. By adding magnetic NPs to phosphate buffer containing 1-ethyl-3-(3-dimethylaminopropyl) Carbodiimide (EDC) and ultrasonication, covalent binding between Fe₂O₄ and carboxymethylated chitosan was created. In a typical reaction, genistein conjugated to Fe₃O₄-CMC. The nanoparticle characterization analysis showed that the drug delivery vehicle had a mean diameter size around 12nm and size distribution, with well bounded components and exhibits high degree of magnetization. MTT assay was used to assess the toxicity effect of pure genistein in comparison with Fe₃O₄-CMC-genistein nano-conjugate on MOLT₄ hematopoitic cancer cells, where the significant increasing inhibition even in low dose on cancerous cells had been observed, which led to suggested as a suitable candidate for chemotherapeutic agent against malignant cells. **Keywords:** Iron oxide nanoparticles; Chitosan; Genistein; Cancer

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Synthesis and Characterization of Chitosan-Coating of NiFe, O₄ Nanoparticles for Biomedical Applications

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Nickel ferrite nanoparticle is a kind of soft magnetic material that is one of the most attractive class of materials due to its appealing properties as well as various technical applications, such as being used as catalyst or in biomedical processes. The present paper focuses first on the synthesis of NiFe₂O₄ nanoparticles through co-precipitation method is reported and resulting in calcined nanoparticles that were achieved at different times and at constant temperature (773 k). Afterwards, they were dispersed in water that was incorporated by chitosan. Chitosan was bonded on the surface of nanoparticles. In order to assess the structural properties of nanoparticles, scanning electron microscopy (FESEM) with EDS and Vibrating Sample Magnetometer (VSM) were conducted at room temperature. FESEM were used to determine the size and shape of particle; the obtained results indicated that the particle was in the range of 15-40 nm and of a circular shape. A stable maximum temperature ranging from 30 to 42 was successfully achieved within 10 min. A specific absorption rate of up to 8.4 W/g was achieved. The study results revealed that the SAR parameter of the coated nickel ferrite nanoparticle is more than that of pure nickel ferrite nanoparticles or Cobalt ferrite.

Keywords: Nickel ferrite nanoparticles; Chitosan biopolymer; Hyperthermia

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