

عنوان مقاله:

Synthesis and Characterization of Δ -Fluorouracil-loaded Calcium Carbonate Nanoparticles and their Cytotoxicity on Colorectal Cancer Cells

محل انتشار:

بیست و یکمین کنگره ملی و نهمین کنگره بین المللی زیست شناسی ایران (سال: 1399)

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خلاصه مقاله:

Colorectal cancer (CRC), as the third most prevalent cancer and fourth principal cause of cancer death worldwide, is in urgent need of effective treatments. Though chemotherapy is still one of the powerful tools available for cancer therapy, it suffers from some limitations including the lack of selectivity, aggregation, and low biocompatibility. Therefore, the application of targeted drug delivery systems (DDS) is of greatest importance, among which nanoparticles have attracted considerable attention as carriers. In this study, after Calcium Carbonate (CaCO_3) nanoparticles were synthesized via spontaneous precipitation method, the synthesized nanoparticles were characterized by X-ray Diffraction (XRD), Fourier transform infrared (FT-IR), and Field Emission Scanning Electron Microscope (FE-SEM). Δ -fluorouracil (Δ -FU), a common anti CRC therapeutic drug, was loaded on CaCO_3 nanoparticles. Then, the cytotoxicity of Δ -FU alone and together with CaCO_3 nanoparticles were evaluated on the murine colorectal cell line, CT-26, by MTT assay. The successful synthesis of CaCO_3 nanoparticles was concluded owing to the crystallinity, purity of CaCO_3 nanoparticles and the appearance of the characteristic vibrational bands attributed to the bending and stretching vibrations of CO_3^{2-} in XRD pattern and FTIR spectrum respectively. Furthermore, after Δ -FU loading on CaCO_3 nanoparticles, absorption bands which belongs to this drug emerged in its FTIR spectrum. Additionally, FE-SEM observations revealed the synthesis of oval-shaped CaCO_3 nanoparticles. The examination of the cytotoxicity of the drug-loaded nanoparticles on cancer cells showed that although free Δ -FU has inhibitory effects on cancer cells with the IC_{50} value of $1.9 \pm 0.1 \mu\text{g ml}^{-1}$, the chemotherapeutic drug efficacy is improved when loaded on CaCO_3 nanoparticles ($\text{IC}_{50} = 0.9 \pm 0.16 \mu\text{g ml}^{-1}$). Based on the findings of this study, Δ -FU-loaded CaCO_3 nanoparticles could be considered as a promising candidate for colorectal cancer therapy.

کلمات کلیدی:

chemotherapy, biocompatibility, drug delivery system

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