عنوان مقاله:

Synthesis and in vitro characterization of PCL-PEG-HA/FeCo magnetic nanoparticles encapsulating curcumin and ۵-FU

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خلاصه مقاله:

Objective(s): Colorectal cancer is the second deadly cancer for men and women worldwide. Depending on the pathological attributes of the tumor, there are numerous therapeutic options for colorectal cancer treatment. Chemotherapy is one of the main methods, however, due to the low solubility and short half-life of chemotherapy drugs, this treatment method has limitations. ۵-Fu and curcumin are important drugs for the treatment of colorectal cancer. One of the primary resolutions is the application of bioanalytical techniques, which involve the utilization of chemotherapy agents in conjunction with nanoparticles, thereby facilitating the directed transportation of the therapeutic substance to malignant cells. Materials and Methods: In this study, Polycaprolactone-Polyethylene glycol- Hyaluronic acid (PCL-PEG-HA) copolymers and magnetic nanoparticle iron-cobalt (FeCo) were synthesized to deliver Curcumin (CU), ۵-Fluorouracil (۵-Fu) and the combination to HCT۱۱۶ colorectal cancer cells. To control the release of CU and ۵-FU and in vivo tumor targeting, PCL-PEG-HA/FeCo were synthesized and then characterized for the morphological characteristics, shape, and magnetic properties of the nanoparticles, drug retention efficiency, and release pattern in two acidic and neutral environments. Results: Our results demonstrated that the release profile of CU and ۵-FU from the nanoparticles in acidic conditions was more than the drug release in neutral conditions. In acidic conditions, due to faster degradation of nanoparticles, drugs are released faster. Moreover, these nanoparticles have high biocompatibility and potential in transporting CU and ۵-FU drugs to HCT۱۱۶ cells. The IC۵۰ of co-delivery of CU and ۵-FU was ۶۵.۴۲ mg/L, while, the IC۵۰ value of drugs coated with nanoparticles (PCL-PEG-HA/FeCo/۵-FU/Curcumin) was ۷۲.۲۶. Otherwise, utilizing nanoparticles can increase the amount of apoptosis compared to control and free ۵-Fu and Curcumin. Conclusion: In conclusion, PCL-PEG-HA/FeCo/۵-FU/Curcumin nanoparticles can be an efficient solution in targeted drug delivery to colorectal cancer cells and reducing the side effects of these drugs on normal cells.

کلمات کلیدی:

Chemotherapy drugs, Drug Delivery, Hyaluronic acid, Polycaprolactone, polyethylene glycol