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Controlled and targeted drug delivery systems using nano-magnetic base polyurethane polymers

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Polyurethanes have great variety of physical and chemical properties due to their different building blocks in their structure which make them possible for different biomedical and pharmaceutical applications. The most important application of these polymers is as a biocompatible, smart and controllable drug carrier which directs the anticancer drugs sufficiently to the cancerous cells for solving the problem of inadequate drug cargo with less side effects to the cancerous tissue cells. In this article, a kind of new drug delivery system is introduced which is smart controllable (pH-sensitive) multifunctional magnetic polyurethane (SCMMP) nano composite composed of isocyanate as a main chain and Cyclodextrin as a chain extender with the magnetic nano particles in their structure. Then Consequently, The bulk structure, size and morphology and magnetic characteristic of the synthetic nano-composite was characterized through different accepted analytical techniques such as FT-IR, TGA, XRD, TEM, SEM, DLS and VSM respectively. The SCMMP was used for loading two effective currently used pharmaceutical cancer agents of Metatroxate and doxorubicin with high loading efficiency of 87% and 89%

respectively. Dual drug loaded nano composite release behaviour was investigated in three different pHs of 4.5, 5.4 and 7.4. According to the concentration profile, low release percentage in the pH=7.4 for long term circulation and good stability in blood stream and high release in pH of 4.5 and 5.4 for improving vast variety of cancerous cells in physiological media were observed. Thereupon, new drug carrier system have great efficacy for cancer therapy. The MTT calorimetric method was used to track the presented nano composite eligibility as a polymer based drug delivery system. Different cellular tests of MTT assay, DAPI staining, cellular uptake and cell cycle was done on Nano composite/DOX/MX combination versus free DOX/MX to validate it as a nano carrier. Biocompatibility of the nano carrier was done using hemolysis assay through checking on human red blood cells (HRBCs) with very fine results. According to the results, introduced system is very effective one for delivering synchronous therapeutic agents of DOX and MX to the cancerous cells and on other hand for in vivo usage in the future.

Biography

Samira Jafari received her master's degree in analytical chemistry from the University of Tabriz and is currently pursuing her doctorate of chemistry in the analytical area at Imam Khomeini International University. In addition to her master's degree, Samira is well travelled in her schooling and as such has acquired a wide range of different chemistry styles. With this experience, she gleaned and culminated a wide scope of techniques to develop a novel method for targeting various cancers efficiently with relatively low costs as compared to customized patient medicines. With a generic customized cancer drug delivery system as described in her work, a new field of focus is presented that can make large strides in the fight against breast cancer.

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