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# Imatinib-loaded PEG-modified magnetic nanoparticles as an anti-cancer agent for pH responsive targeted drug delivery

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**Abstract: Targeted drug delivery is a promising approach to overcome the limitations of classical chemotherapy. In this respect, Imatinib-loaded PEG-modified magnetic nanoparticles were prepared as a pH sensitive system for targeted delivery of drug to tumor sites by applying a magnetic field. The proposed magnetic nanoparticles were prepared through modification of magnetic $Fe_3O_4$ nanoparticles with PEG400 and then Imatinib. The structural, morphological and physicochemical properties of the synthesized nanoparticles were determined by different analytical techniques including energy-dispersive X-ray spectroscopy (EDS), field emission scanning electron microscopy (FE-SEM), Fourier-transform infrared (FTIR) spectroscopy, transmission electron microscopy (TEM), vibrating sample magnetometry (VSM), and X-ray diffraction (XRD). UV/visible spectrophotometry was used to measure the Imatinib contents. Drug loading and release profile of the prepared particles was investigated. The results demonstrated that $Fe_3O_4$@PEG acts as a pH responsive nanocarrier in releasing the loaded Imatinib molecules. Furthermore, the $Fe_3O_4$@PEG/Imatinib nanoparticles displayed cytotoxic effect against MCF-7 breast cancer cells.**

**Keywords: Targeted Drug Delivery, Magnetite Nanoparticles, PEG, Imatinib, MCF-7**

## 1. Introduction

Cancer is a disorder that a group of cells or many of them affect. In first, a special part of body be weak and can't do its function very well .After a while, with progressing of cancer, many parts of body will remove.In those with many developments of the disease, there may be swollen lymph nodes, bone pain, shortness of breath, anemia, yellow skin, and death.[1] There are a series of remedial approaches to remedy cancer, including surgery, radiation therapy, chemotherapy, immunotherapy, and hormone therapy.[2] Chemotherapeutic drugs, including tyrosine kinase inhibitor (such as imatinib), passive materials of DNA (such as nitrosoureas, nitrogen mustards, aziridines, tetrazines, cisplatins and derivatives), antimetabolites (such as anti-folates, deoxynucleoside analogues, thiopurines and fluoropyrimidines), antitubulin agents (such as taxis), topoisomerase inhibitors (such as topotecan, irinotecan, doxorubicin, etoposide, teniposide, mitoxantrone, aclarubicin, merbarone, and novobiocin,), cytotoxic antibiotics (daunorubicin and pirarubicin), and most frequently use hormones cause unfavorable effects, including drug resistance, bone marrow suppression, hair loss, neurological dysfunction, and gastric ulcer.[3,4] Considering the above complications of the treatments currently considered for cancer, high costs of conventional treatments, and growing incidence of cancer in both developing and