

Preparation and evaluation of superparamagnetic iron oxide nanoparticles coated with chitosan for targeting and controlled drug delivery of methotrexate

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Background and Aims: Today, targeting and controlled drug delivery systems is the main goal of drug therapy. Magnetic targeting drug delivery is the one of these systems. In our study, Fe₃O₄ super paramagnetic nanoparticles was synthesized and stabilized by chitosan. Then nanoparticles were characterized by Fourier transform infrared spectroscopy (FT-IR) and transmission electron microscopy (TEM). Particle size distribution and zeta-potential of the particles were assessed using zeta sizer. The paramagnetic behavior of the uncoated and chitosan coated nanoparticles were measured using vibrating sample magnetometry (VSM). Particles morphology and size range of uncoated iron oxide nanoparticles also evaluated by TEM showing uniform size with narrow size distribution about 10 nm. After coating nanoparticles with chitosan and loading of methotrexate (MTX), the change in size was assessed using zeta sizer. Considerable amount increase in size was observed after coating the particles with chitosan and loading with MTX, (the average size was 152 nm). Paramagnetic properties of the uncoated and chitosan coated particles was assessed showing considerable amount decreasing in paramagnetic behavior after coating with chitosan, but it was considerable high to response the magnetic field. Finally loading efficiency and release rate of MTX from nanoparticles was assessed showing slow release behavior, suggesting this formulation as a good candidate for targeting and controlled delivery of MTX.

Keywords: Fe₃O₄; Nanoparticles; Chitosan; Methotrexate