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Tragacanth gum-based nanogel as a super paramagnetic molecularly imprinted polymer for quercetin recognition and controlled release

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A highly selective magnetic molecularly imprinted polymer (MMIP) with core-shell structure has been synthesized by a sol-gel process composed of Tragacanth Gum (TG) cross-linker, Fe3O4/SiO2 nanoparticles, and N-vinyl imidazole (VI) functional monomer in the presence of template Quercetin (QC). Different techniques including scanning electron microscopy (SEM), SEM-energy dispersive spectroscopy (SEM-EDS), vibrating sample magnetometer (VSM) and transmission electron microscopy (TEM) were used to verify the successful synthesis of MIP on the surface of Fe3O4/SiO2 nanoparticles. The swelling behavior of MMIP, its recognition and selectivity for QC and structural analog, Catechin (CT), were tested and compared with magnetic non imprinted polymer (MNIP). MMIP adsorbs the template drug quickly and equilibrium could be reached in 2 hours. The mechanism for adsorption was found to follow the Langmuir model with the maximum capacity of 175.43 mg g-1. The MMIP indicated excellent recognition and binding affinity toward QC, selectivity factor (ε) relative to CT was 2.16. Finally, the MMIP was evaluated as a drug delivery device by performing in vitro release studies in PBS.

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Preparation and evaluation of SEDDS of metformin by *in vitro*, *ex vivo* and *in vivo* techniques

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The objective of this work was to formulate a self emulsifying drug delivery system (SEDDS) of metformin, a poorly soluble drug and to evaluate by in vivo, in vitro and ex vivo techniques. Oils and surfactants were screened out depending upon their solubilizing capacity. Among all of the solvents, Tween 80 showed very good solubilizing capacity which was 60 mg/gm. Two excipient were used to prepare metformin SEDDS. Formulations were initially checked for the color, clarity and sedimentation. The SEDDS formulations were transparent and clear. Formulation F3 containing 1:1 (m/m) mixture of Tween 80/Capryol 90 produced smallest micro-emulsion with particles size of 11.34 μm and drug release was higher than other formulation (101% within 20 min). Ex vivo study of the SEDDS formulation was evaluated using guinea pig intestinal sac. Drug diffused from F3 formulation was significantly higher than pure drug of metformin ($p<0.001$). In vivo study of SEDDS was performed in albino mice using plasma glucose level as a pharmacodynamic marker parameter. The test formulation (F3) appeared remarkable reduction in plasma glucose level, after oral administration which showed that SEDDS may be an effective technique for the oral administration of metformin.

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