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Facile preparation and characterization of pH sensitive Mt/CMC nanocomposite hydrogel beads for propranolol controlled release

Hassan Farhadnejad^{a, b}, Seyed Alireza Mortazavi^{a*}, Mohammad Erfan^a, Behzad Darbasizadeh^a, Hamidreza Motasadizadeh^c, Yousef Fatahi^c

^a Department of Pharmaceutics and Pharmaceutical Nanotechnology, School of Pharmacy, Shahid Beheshti University of Medical Sciences, Tehran, Iran

^b Students' Research Committee, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

^c Department of Pharmaceutical Nanotechnology, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran.

*Mail: mortazavisar@yahoo.com

Abstract

The main aim of the present study was to design pH-sensitive nanocomposite hydrogel beads, based on carboxymethyl cellulose (CMC) and montmorillonite (Mt)-propranolol (PPN) nanohybrid, and evaluate whether the prepared nanocomposite beads could potentially be used as oral drug delivery systems. PPN—as a model drug—was intercalated into the interlayer space of Mt clay mineral via the ion exchange procedure. The resultant nanohybrid (Mt-PPN) was applied to fabricate nanocomposite hydrogel beads by association with carboxymethyl cellulose. The characterization of test samples was performed using different techniques: X-Ray Diffraction (XRD), IR spectroscopy (FT-IR), thermal gravity analysis (TGA), and scanning electron microscopy (SEM). The drug encapsulation efficiency was evaluated by UV–vis spectroscopy, and was found to be high for Mt/CMC beads. In vitro drug release test was performed in the simulated gastrointestinal conditions to evaluate the efficiency of Mt-PPN/CMC nanocomposite beads as a controlled-release drug carrier. The drug release profiles indicated that the Mt-PPN/CMC nanocomposite beads had high stability against stomach acid and a sustained- and controlled-release profile for PPN under the simulated intestinal conditions.

Key words: nanocomposite hydrogel, Carboxymethyl Cellulose, Montmorillonite, drug delivery

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