Bioavailability Enhancement of Aripiprazole Via Silicosan Particles: Preparation, Characterization and In vivo Evaluation

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Abstract

The aim of this study was to design a novel carrier for enhancing the bioavailability of the poorly water-soluble drug, aripiprazole (ARP). Silicosan, the applied carrier, was obtained by chemical interaction between tetraethyl orthosilicate (TEOS) and chitosan HCl. Different ARP-loaded silicosan particles were successfully prepared in absence and presence of one of the following surfactants; Tween 80, Poloxamer 407 and cetyltrimethylammonium bromide (CTAB). The prepared ARP-loaded silicosan particles were thoroughly investigated for their structures using FTIR, XRD, and DSC analysis as well as their particle size, zeta potential, flowability, drug content, and in vitro drug release efficiencies. The prepared ARP-loaded silicosan particles were characterized by amorphous structure, high drug entrapment efficiency and a remarkable improvement in the release of aripiprazole in simulated gastric fluid. SEM and EDX revealed that the morphology and silica atom content in the prepared ARP-loaded silicosan particles were affected by the used surfactant in their formulations. The selected ARP-loaded silicosan particles were subjected to in vivo study using rabbits. The obtained pharmacokinetic results showed that the relative bioavailability for orally administered ARP-loaded silicosan particles (SC-2 -CTAB) was 66% higher relative to the oral suspension (AUC0-10h was 16.38¡Ñ¡ 3.21 and 27.23¡Ñ¡2.35 ng.h/mL for drug powder and SC-2-CTAB formulation, respectively). The obtained results suggested the unique-structured silicosan particles to be used as successful vehicle for ARP

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