Spray-Dried Silica Xerogel Nanoparticles as a Promising Gastroretentive Carrier System for the Management of Chemotherapy-Induced Nausea and Vomiting

باللغة الإنجليزية

The current work aimed to develop spray-dried silica xerogel nanoparticles(SXNs) as a gastroretentive carrier for the dual delivery of chlorambucil (CHL) andgranisetron hydrochloride (GR). As a low-density system, it was proposed to float overgastric fluids; allowing for the retention of CHL in the acidic medium where it is more stablewhile ensuring the solubility of GR.Silica xerogels were developed by sol-gel process, using Tetraethyl orthosilicate(TEOS) water and acetic acid, followed by spray drying. SXNs were evaluated for particlesize, zeta potential, entrapment efficiency (EE%), CHL and GR release after 1 hr (P1h) andafter 8 hrs (P8h). The best achieved system (SXN4) was evaluated for morphology, porediameter, total porosity, bulk density, wetting time, floating characteristics. Furthermore, thepharmacokinetics of the loaded drugs were evaluated in rats; relative to an aqueous CHLsuspension containing GR.SXN4 system had the highest desirability (0.69); showing spherical nanoparticles(181.63 nm), negative zeta potential (−5.18 mV), promising EE% of 59.39% and 73.94%(for CHL and GR, respectively) and sustained CHL and GR release profiles characterized bylow P1h (22.75% and 30.74%) and high P8h (60.36% and 99.33%), respectively. It hada mean pore diameter of 8.622 nm, a total porosity of 62.27%, a bulk density of 0.605 g/mL,a wetting time of 292 sec, zero lag time and a floating duration of at least 8 h.The prolongation in the mean residence time (MRT (0-∞)) and the promotion ofthe relative oral bioavailabilities of both drugs could unravel the potential of this system forthe management of chemotherapy-induced nausea and vomiting.