Transdermal Delivery of Ondansetron Hydrochloride via Bilosomal Systems: In Vitro, Ex Vivo, and In Vivo Characterization Studies

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Abstract

Ondansetron hydrochloride (OND) is commonly used for management of postoperative and chemotherapeutic-induced nausea and vomiting. It suffers from low bioavailability (60%) and rapid elimination (t1/2; 3–4 h). The current work aimed to develop OND-loaded bilosomes as a promising transdermal delivery system capable of surmount drug limitations. The variables influencing the development of OND-loaded bilosomes and niosomes (18 systems) via the thin film hydration technique were investigated, including surfactant type (Span®60 or Span®80), surfactant/cholesterol molar ratio (7:0, 7:1, or 7:3), and sodium deoxycholate (SDC) concentration (0, 2.5, or 5%, w/v). The systems were characterized for particle size, polydispersity index, zeta potential, drug entrapment efficiency (EE%), and in vitro permeation. Based on factorial analysis (32·21) and calculations of desirability values, six systems were further subjected to ex vivo permeation through excised rat skin, differential scanning calorimetry (DSC), powder x-ray diffraction (PXRD), and transmission electron microscopy. Histopathological and in vivo permeation studies in rats were conducted on the best achieved system (B6) in comparison to drug solution. Higher desirability values were achieved with Span® 60-based bilosomes, surfactant/cholesterol molar ratio of 7:1, and SDC concentration of 2.5% w/v with respect to small vesicle size, polydispersity index and high zeta potential, EE%, and cumulative drug permeation. OND was dispersed in amorphous state as revealed from DSC and PXRD studies. No marked effect was observed in rat skin following application of B6 system while higher ex vivo and in vivo cumulative permeation profiles were revealed. Bilosomal systems were considered as safe and efficient carriers for the transdermal delivery for OND

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