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Original research paper

Design and evaluation of a bioadhesive film for transdermal delivery of propranolol hydrochloride

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The objective of the study was to develop a suitable transdermal delivery system for propranolol hydrochloride (PPL) *via* employing chitosan as a film former. Drug concentration uniformity, thickness, moisture uptake capacity and skin bioadhesion of the films were characterized. The effects of chitosan and PPL concentration and different penetration enhancers on the release and permeation profiles from the films were investigated. Skin irritation of the candidate film was evaluated. Chitosan film (PPL 2 mg cm^{-2}, chitosan 2 %, *m*/*m*, cineol 10 %, *m*/*m*) was found nonirritant and achieved 88.2 % release after 8 hours in phosphate buffer. Significant high ($p < 0.001$) permeation of PPL through rat skin was obtained using this film compared to the film without enhancer (about 8 times enhancement factor), making it a promising transdermal delivery system for PPL.

Keywords: transdermal delivery, propranolol hydrochloride, chitosan film, enhancers

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Oral administration is one of the most convenient ways that are acceptable for patients, useful and suitable for drugs that are not subjected to intestinal and/or hepatic first-pass metabolism (1). However, there are several shortcomings that should be overcome to achieve efficient drug therapy: the intestinal and/or hepatic first-pass elimination, high variance in bioavailability, difficulty in long-term and rate-regulated absorption and impossibility of arbitrary drug input and its interruption (2). Transdermal route is one of the potential alternative routes that may bypass undesirable characteristics of oral administration. Propranolol, a β-blocker, has short biological half-life and is extensively subjected to hepatic first-pass metabolism (3). Propranolol · HCl (M_r 135, water solubility > 150 mg mL^{-1}) can be a potential candidate for transdermal use. Recently, development of transdermal drug delivery systems (TDDS) has been focused on the for-

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