

J. Pharm. Pharmacol., 52, 1179-1186 (2000).

Synergistic effect of iontophoresis and pretreatment of jet injector on the in vitro skin permeation of diclofenac and angiotensin II

Kenji Sugibayashi (杉林堅次) Midori Kagino (鍵野みどり),  
Sachihiko Numajiri (沼尻幸彦), Naoko Inoue, Daisuke Kobayashi (小林大介),  
Masayuki Kimura, Masatoshi Yamaguchi and Yasunori Morimoto (森本雍憲)

<sup>1</sup>Faculty of Pharmaceutical Sciences, Josai University, <sup>2</sup>Life Science Research Center, Josai University, <sup>3</sup>Department of Pharmacy Services, Saitama Medical Center, Saitama Medical School, <sup>4</sup>Department of Pharmacy, Niigata Prefectural Muikamachi Hospital

A non-needle syringe (jet injector) was utilized to increase skin permeation of drugs by iontophoresis. Briefly, physiological saline was initially flushed by jet injector to make a pore in the stratum corneum of excised hairless rat, and the iontophoretic skin permeation of two model compounds, sodium diclofenac and angiotensin II, was followed using a 2-chamber diffusion cell. Constant voltage and constant current iontophoresis treatment were evaluated. Pretreatment using the jet injector alone resulted in about 13- and 22-fold increases in the steady-state flux of diclofenac and angiotensin II, respectively, through the skin, compared with non-treated controls. Jet injector pretreatment with constant voltage iontophoresis further enhanced skin permeation of diclofenac and angiotensin II, and the enhancement was also greater than that by constant voltage iontophoresis alone. Thus, a synergistic effect was observed. The ratio of enhancement was greater compared with the control. Jet injector pretreatment with constant current iontophoresis, however, did

not always yield higher skin permeation of the drugs than injector pretreatment alone, although the lag time was shortened. The difference in the enhancement between the constant voltage- and constant current iontophoresis can be explained by the electric current through the excised skin.

Constant current iontophoresis after a short period of constant voltage iontophoresis with multiple jet injector pretreatment may be the best way to increase drug permeability while preventing severe skin damage.