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A novel in vivo model for the study of transdermal drug penetration

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Background: Transdermal drug delivery is a useful alternative pathway for many therapeutic agents. Thus, study and enhancement of the transdermal penetration is an important research goal. Our objective was to develop a novel experimental model which permits precise determination of the quantity of drug penetrating living full-thickness skin.
Materials and Methods: The experiments were performed on male SKH-1 hairless mice. A skin fold in the dorsal region was formed and fixed with two symmetrical fenestrated titanium plates. A circular wound was made on one side of the skin fold. A metal cylinder with phosphate buffer was fixed into the window of the titanium plate. A gel containing ibuprofen was applied to the other (non-wounded) side of the skin fold. The observation period lasted for 6h. Buffer samples were collected and blood samples were taken, as well. Concentration of the penetrated drug was measured by means of high-performance liquid chromatography. Further, microcirculation of the skin fold was observed with intravital videomicroscopy and histological analysis was performed, too.

Results: The skin fold was morphologically intact and had a healthy microcirculation. The drug appeared in the acceptor buffer after 30 min and its concentration exhibited a continuous increase. The presence of ibuprofen was also detected in the plasma.
Conclusion: Our model allows repeated measurements in the same animal, simultaneous studies of penetration and absorption and examinations of the microcirculation of the skin. This model may be a useful addition in the armamentarium of penetration studies.