Use of skin preparation pad abrasion or microneedling pretreatment improves absorption of methyl aminolevulinate cream in *ex vivo* human skin

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INTRODUCTION

Metvix® cream contains methyl aminolevulinate. Conventional photodynamic therapy (PDT) and more recently daylight PDT with Metvix® has proven its efficacy in the treatment of actinic keratosis. With PDT, pretreatment of skin is considered essential to enhance the penetration of topically applied photosensitizer. In European guidelines, curettage is the recommended pre-treatment procedure. However, alternative procedures are emerging, such as microneedling, ablative fractional lasers, non-ablative fractional lasers, and even a simple method such as derma-sanding with sterile sandpaper. The objective of this work was to evaluate the effect of microneedle and skin preparation pad on dermal absorption of [^{14}C]-methyl aminolevulinate (MAL) contained in Metvix® cream in *ex vivo* human skin.

METHODS

Ex vivo human skin samples from 4 different donors were pretreated as follows:

- 10 passages of Ambu® Unilect™ 2121M Skin Prep Pads (Denmark)
- 2 passages of Dermaroller® Model 902 (200 µm needle length) (Germany)

Skin samples were then treated with 100 mg/cm² of Metvix® cream containing [^{14}C]-MAL for 2.5 hours.

Skin samples mounted on Transwell® inserts in 6-well plate, were kept in cell culture incubator set at 37°C under gentle shaking.

Intact skin samples were used as controls.

Read out:

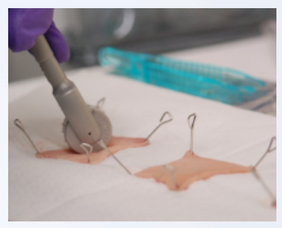
- Transepidermal water loss (TEWL)
- Concentration of [^{14}C]-MAL in total skin and receptor liquid measured by LSC


Human skin samples

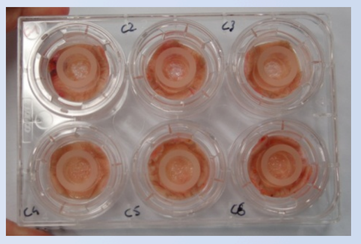
Dermaroller® Model 902


Ambu® Unilect™ Skin Prep Pads


Measurement of TEWL


Treatment of human skin samples with microneedle device


Treatment of human skin samples with Ambu® skin Prep Pad



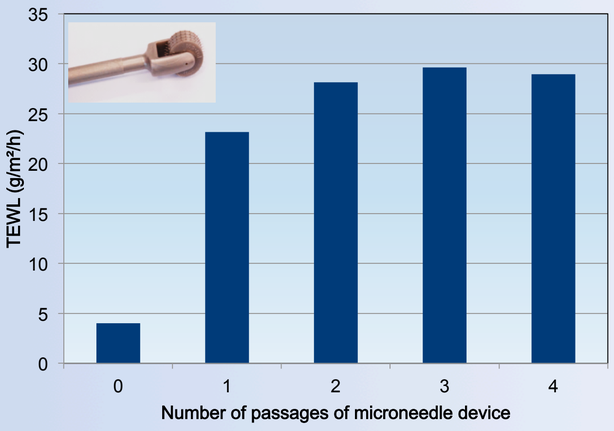
Human skin samples mounted in Transwell insert in 6-well plate

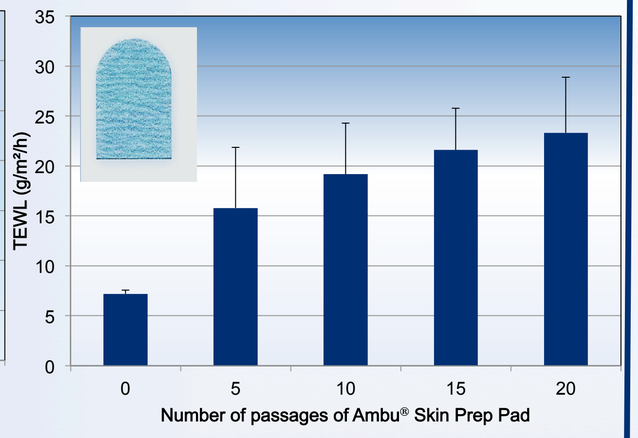
Metvix® Cream

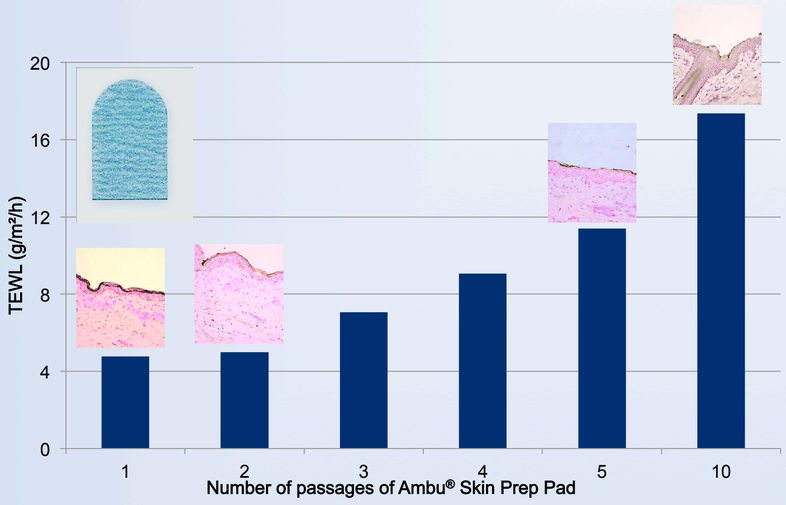

Treatment of human skin samples with Metvix cream

RESULTS

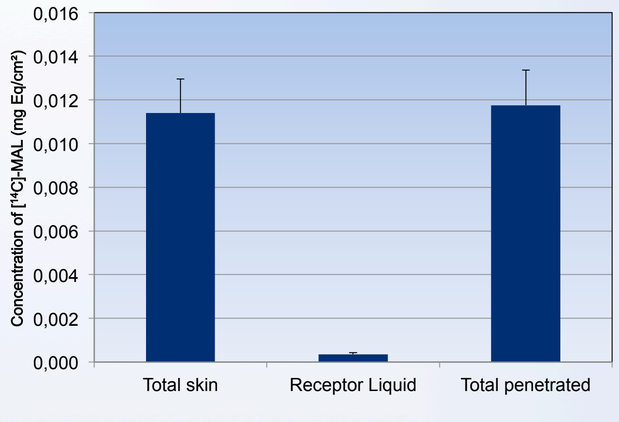
Effect of microneedle device and Ambu® skin preparation pad on TEWL in *ex vivo* human skin

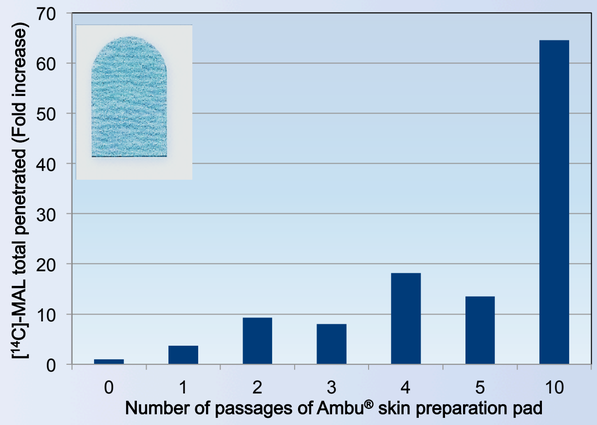


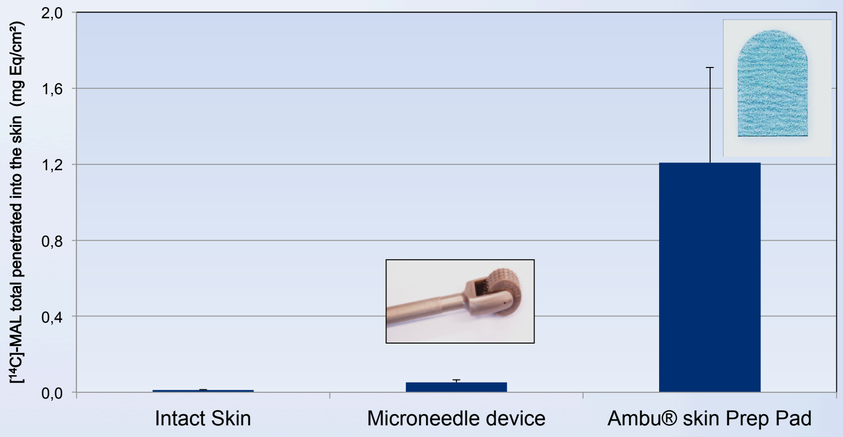




Effect of microneedle device and Ambu® skin preparation pad on MAL skin penetration in *ex vivo* human skin







- TEWL increased with increasing number of passages of microneedle device and Ambu® skin preparation pad. TEWL increased from the first passages of skin preparation pad, with no apparent damage of the epidermis.
- MAL was mainly distributed in the skin as already shown in *ex vivo* human skin [1].
- Ambu® skin prep pad induced a 100-fold increase of MAL total penetrated into the skin, while microneedling induced a 4-fold increase.
- Skin penetration of MAL increased from the first passage of skin preparation pad.

CONCLUSION

Use of microneedle device or skin preparation pad increases TEWL and skin penetration of [^{14}C]-MAL on *ex vivo* human skin.
This indicates that both procedures considerably improve skin penetration, with skin preparation pad being the more efficient tool.

1. H. Osman-Ponchet et al., Lack of effect of selected sunscreens applied on *ex vivo* human skin for 5-methyl-aminolevulinic acid penetration and protoporphyrin IX photoactivation. (2017), Photodiagnosis and Photodynamic Therapy.