

# Dermaroller TRANSDERMAL APPLICATION DERMAROLLER® DERMASTAMP®

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## The device



The Dermaroller® is a round arranged microneedle device, patented in Germany in 2000. It is a CE marked, gamma-sterilized class IIa medical device. Microneedles are made of stainless steel and excel in tensile strength, hardness and tip sharpness. The Dermaroller's main advantage over flat microneedle arrays is a reduction of the force required to penetrate the skin.

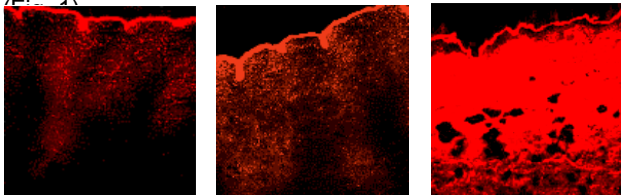
For pinpoint treatments of small skin areas, a smaller static model is available: the Dermastamp®.

In the near future, a flat stainless steel needle array for transdermal drug delivery will be available.



## Dermaroller enhances transdermal delivery

Transdermal delivery with microneedles offers a soft and effective alternative to pinpoint or systemic channeling of drugs or vaccines into the body. Studies *in vitro* and *in vivo* prove that the Dermaroller efficiently breaches the *stratum corneum* and enhances the transport of active substances, whether they are hydrophilic, lipophilic or macromolecular, into the skin<sup>1-4</sup>. The distribution profile of the substance in the skin depends on the needle length (Fig. 1).



Liposomes alone + Dermaroller (0.13 mm) + Dermaroller (1.5 mm)

Fig. 1: CLSM images of human skin incubated with fluorescent liposomes without (left) and with Dermaroller application (Verma & Fahr, 2001)

## Pore closure time

*In vivo* confocal laser scanning microscopy (CLSM) images from Charité, Berlin, show that the *stratum corneum* closes again within 10-15 min. after skin pricking if the skin is left unoccluded<sup>5</sup> (Fig. 2). Thus the risk of post-treatment skin infections is very low. If desired, the microchannels can be kept open for 24-72 hours by occluding them<sup>2,3</sup>.

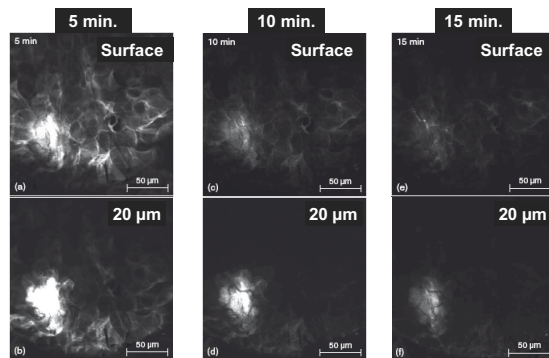


Fig. 2: *In vivo* CLSM images of human skin taken 5 to 15 minutes after a fluorescent dye was applied with a 0.3 mm Dermastamp (Bal et al., 2010)

## Transdermal applications

There is a wide range of applications for Dermaroller/-stamp in the transdermal field. As already mentioned, a microneedle (pre)treatment is very efficient in enhancing the transdermal delivery of various substances including optical skin clearing agents<sup>6</sup>, opioid antagonists<sup>7</sup>, and insulin<sup>8</sup>.

In **photodynamic therapy (PDT)**, microneedles can reduce both the application time (up to 80% from our experience) and the ALA-dose required to induce high levels of the pPLX photosensitizer<sup>9,10</sup> without causing negative side effects<sup>11</sup>. The Dermastamp is ideal for pinpoint transdermal delivery of ALA (Fig. 3). The Dermaroller is preferable for larger areas.



Fig. 3: Therapy resistant wart before and 2 months after sub-luminescence PDT (right) for which ALA was deeply infiltrated with a Dermastamp (middle) (photos by Dr. Strasser, Freiburg/Germany)

A new focus is **transcutaneous vaccination**. Transcutaneous vaccination targets the Langerhans' and dendritic cells in the skin, thus increasing the immune response or allowing for a reduced vaccine dose. The needles of the Dermastamp cage a defined vaccine or drug droplet by surface tension. The concave form increases the droplet's volume (Fig. 4). Current studies at the University of Leiden, NL, conclude that the Dermastamp with its very sharp needles is a promising tool for transcutaneous vaccination in a poke and patch approach<sup>12</sup>.

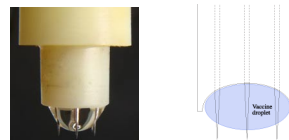


Fig. 4: Dermastamp caging a drug droplet (left) and illustration of droplet

## Adverse effects

With the short needles used in transcutaneous vaccination / transdermal delivery, the Dermaroller treatment is generally painless and free of adverse effects<sup>13</sup>. If longer needles are used, local anesthesia with a topical cream is advisable.

## References

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The complete list of references is available on request to [at@dermaroller.de](mailto:at@dermaroller.de)