Risikobewertung von Nanopartikeln in kosmetischen Produkten

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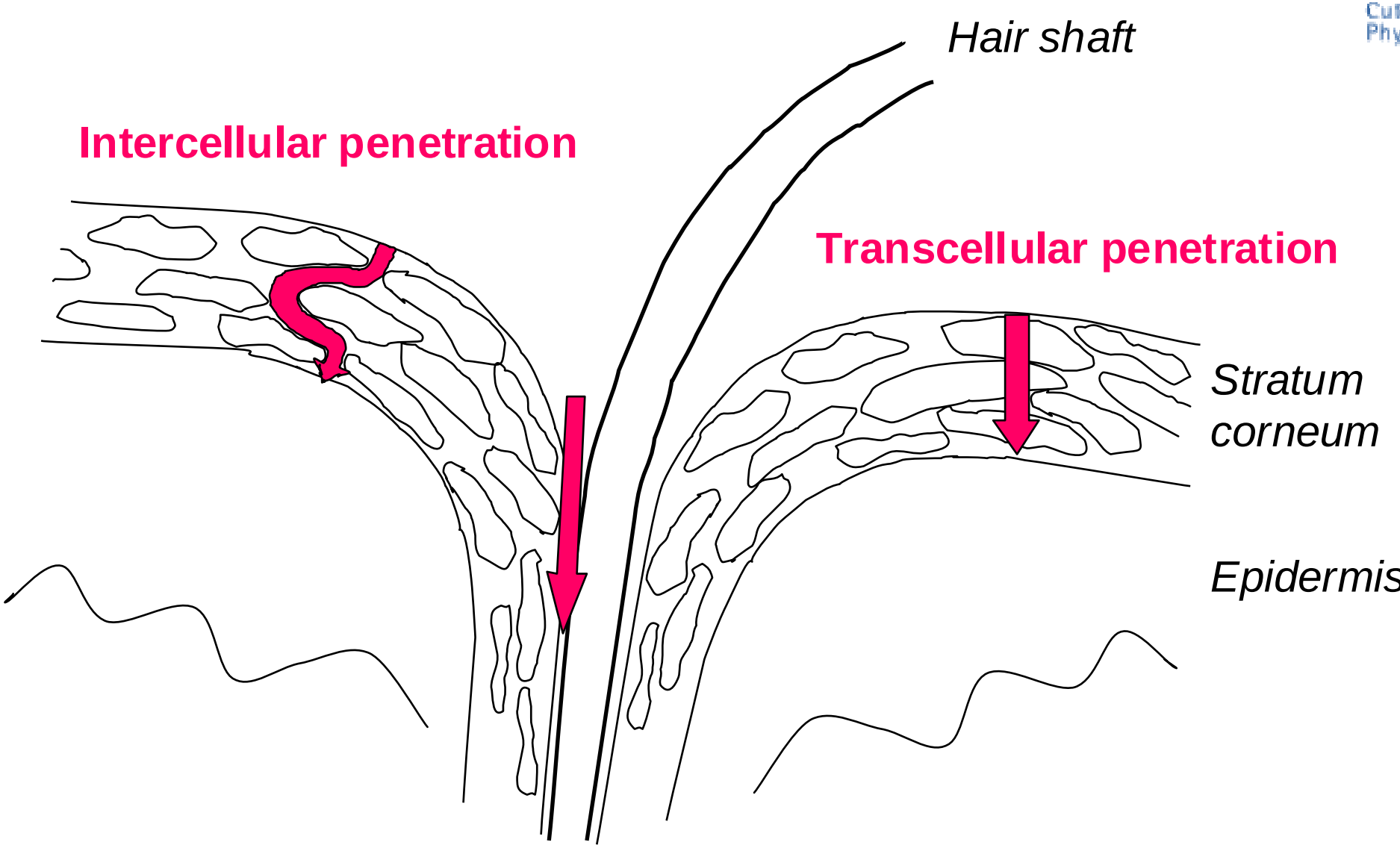
Gliederung

- Penetrationswege von Nanopartikeln
- Einfluss der Größe von Nanopartikeln auf die Speicherung und die Penetration

Penetration pathways



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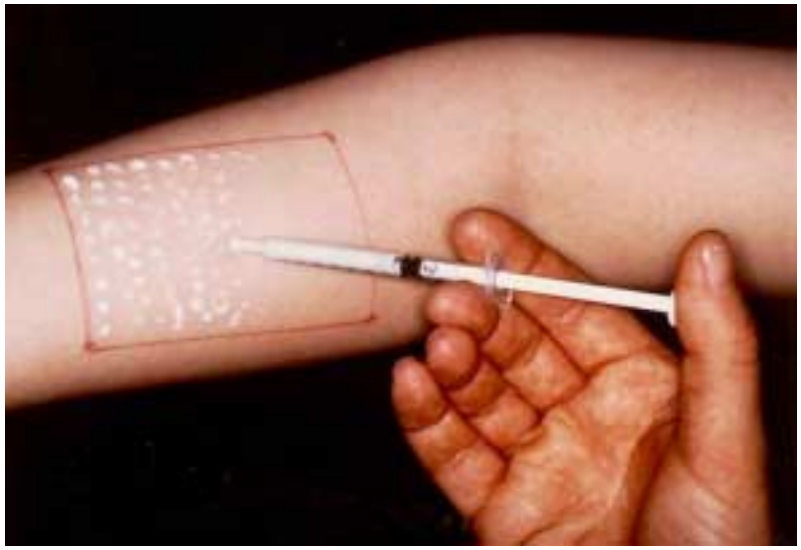
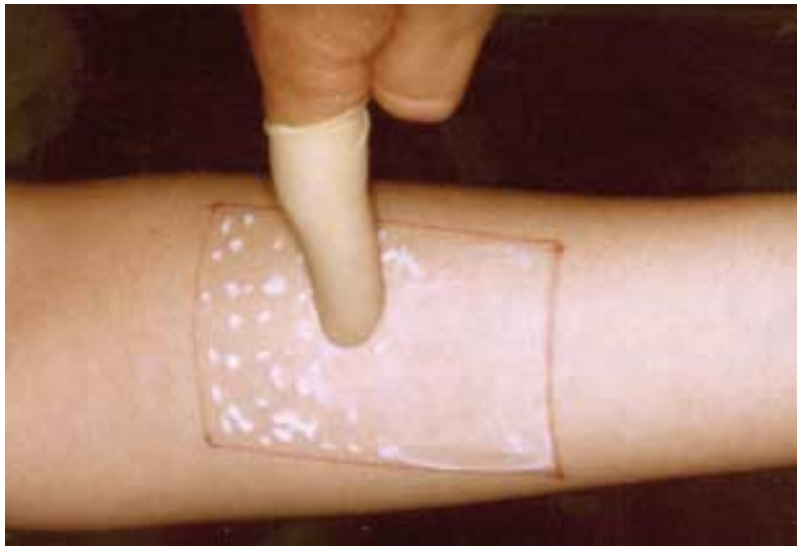
Investigation of intercellular penetration by tape stripping

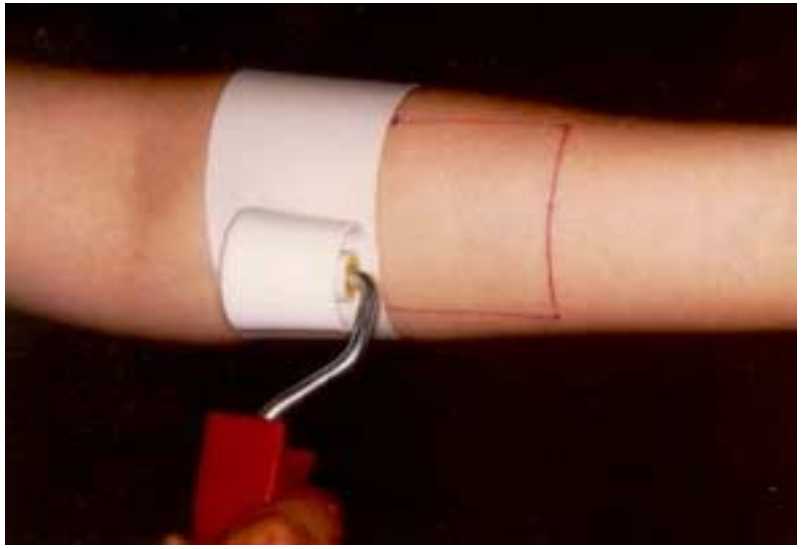
Method of tape stripping



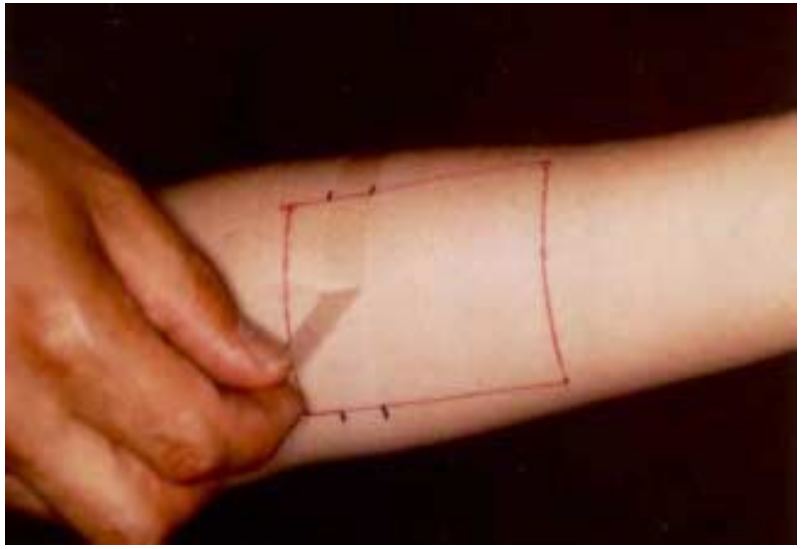
Application of the emulsion



Homogeneous distribution

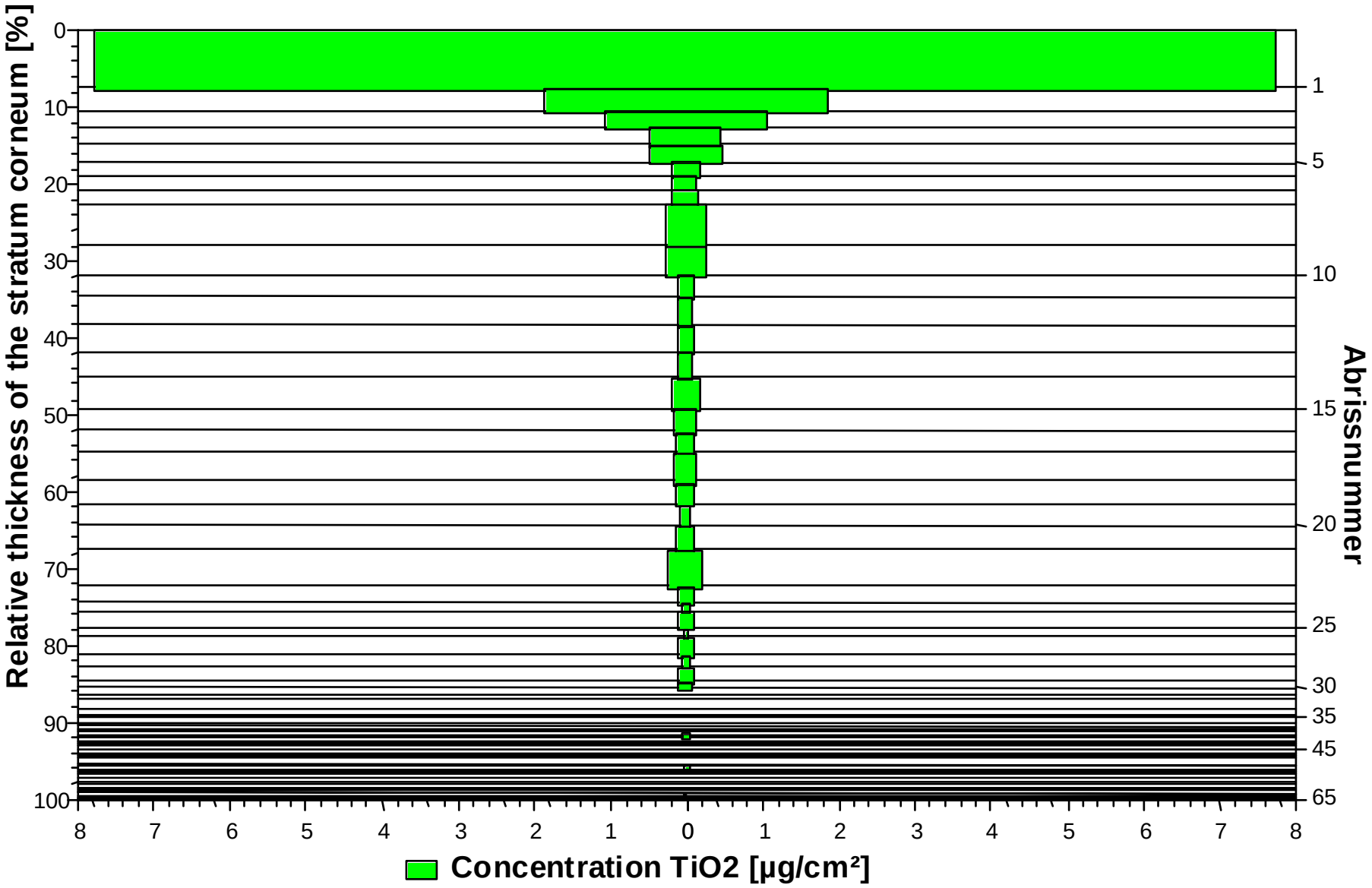


Pressing of the tape by a roller



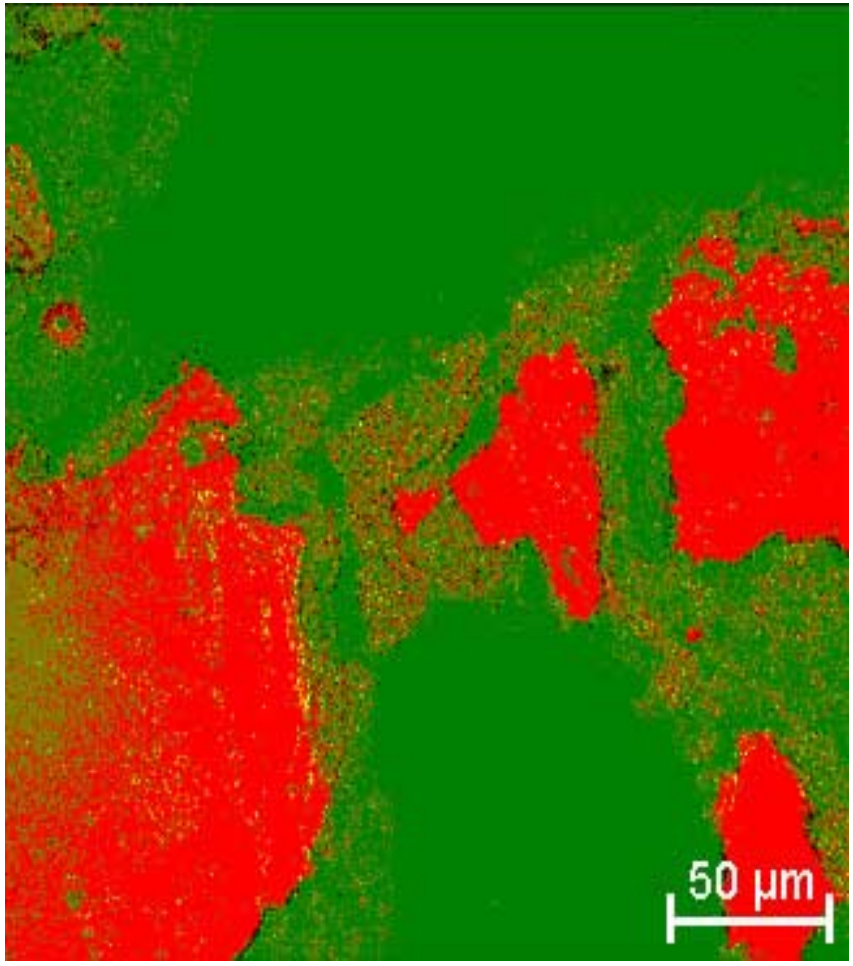
Removing of the adhesive film

Penetration profile of TiO_2 in the stratum corneum



Distribution of TiO_2 on the removed tape strips

1st tape strip



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Investigation of follicular penetration

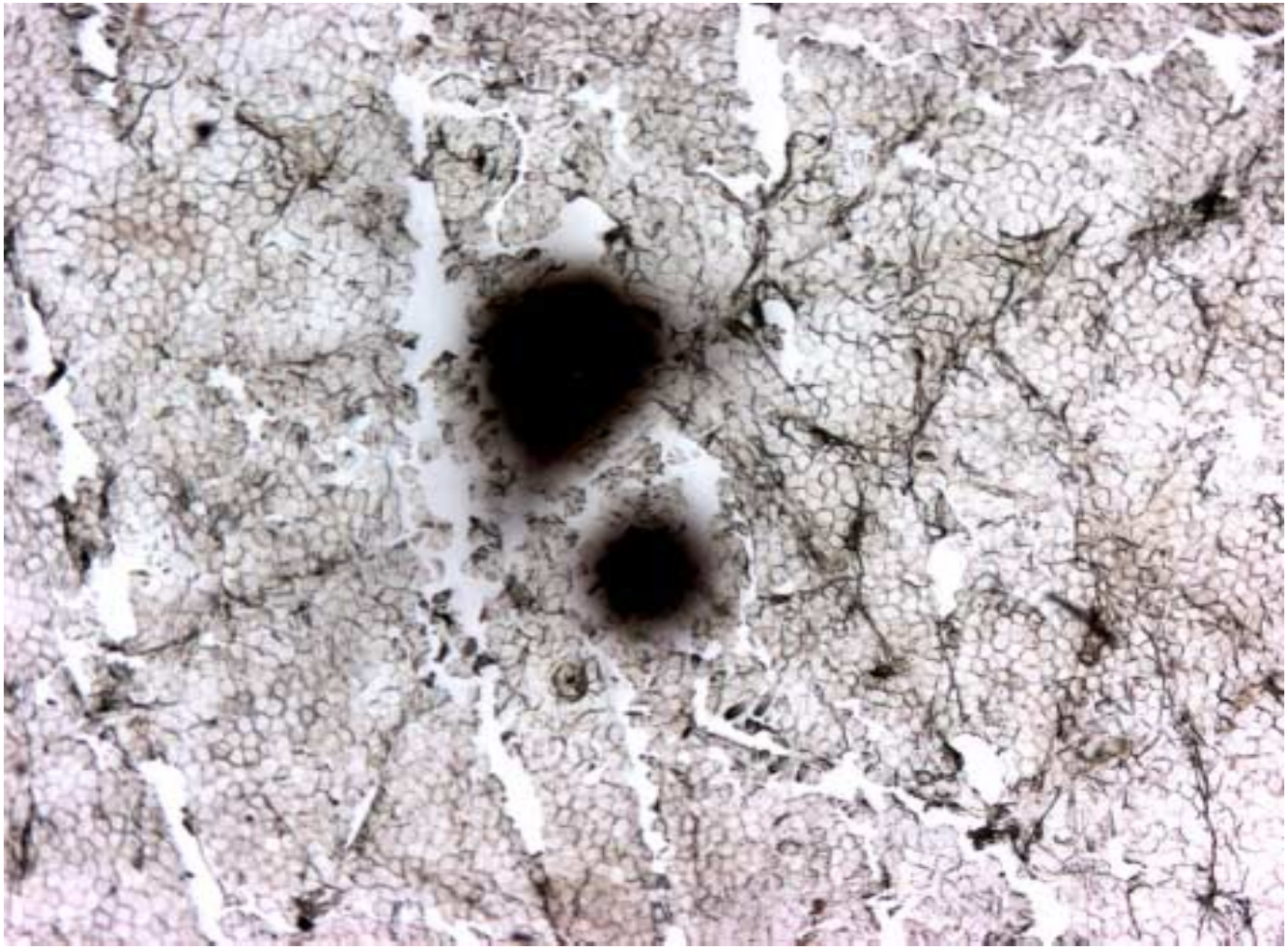
Penetration measurements of TiO_2

Skin surface after 25 removed tape strips

Sunscreen residual components can be clearly observed in the follicle openings

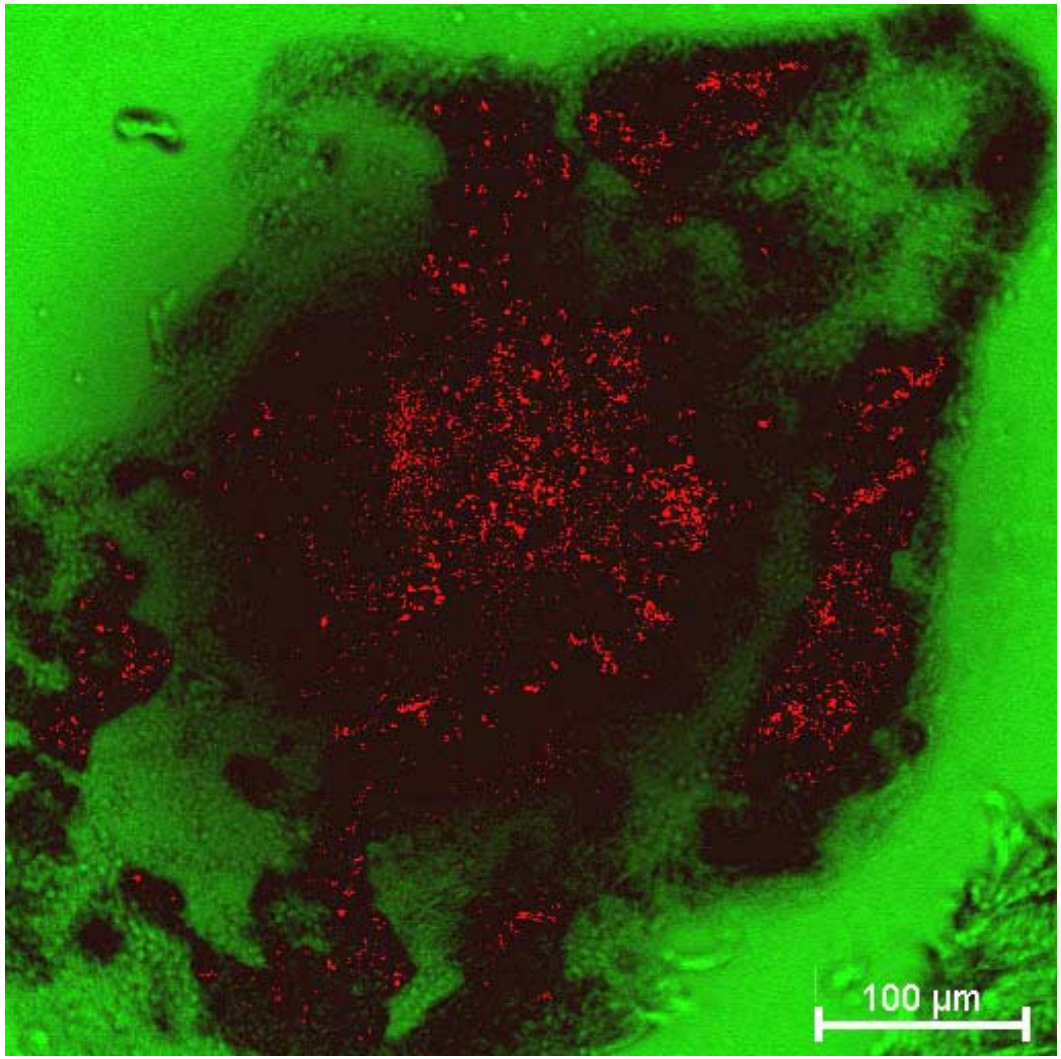
Position of the hair follicles on the removed tape strips

Staining by OsO_4

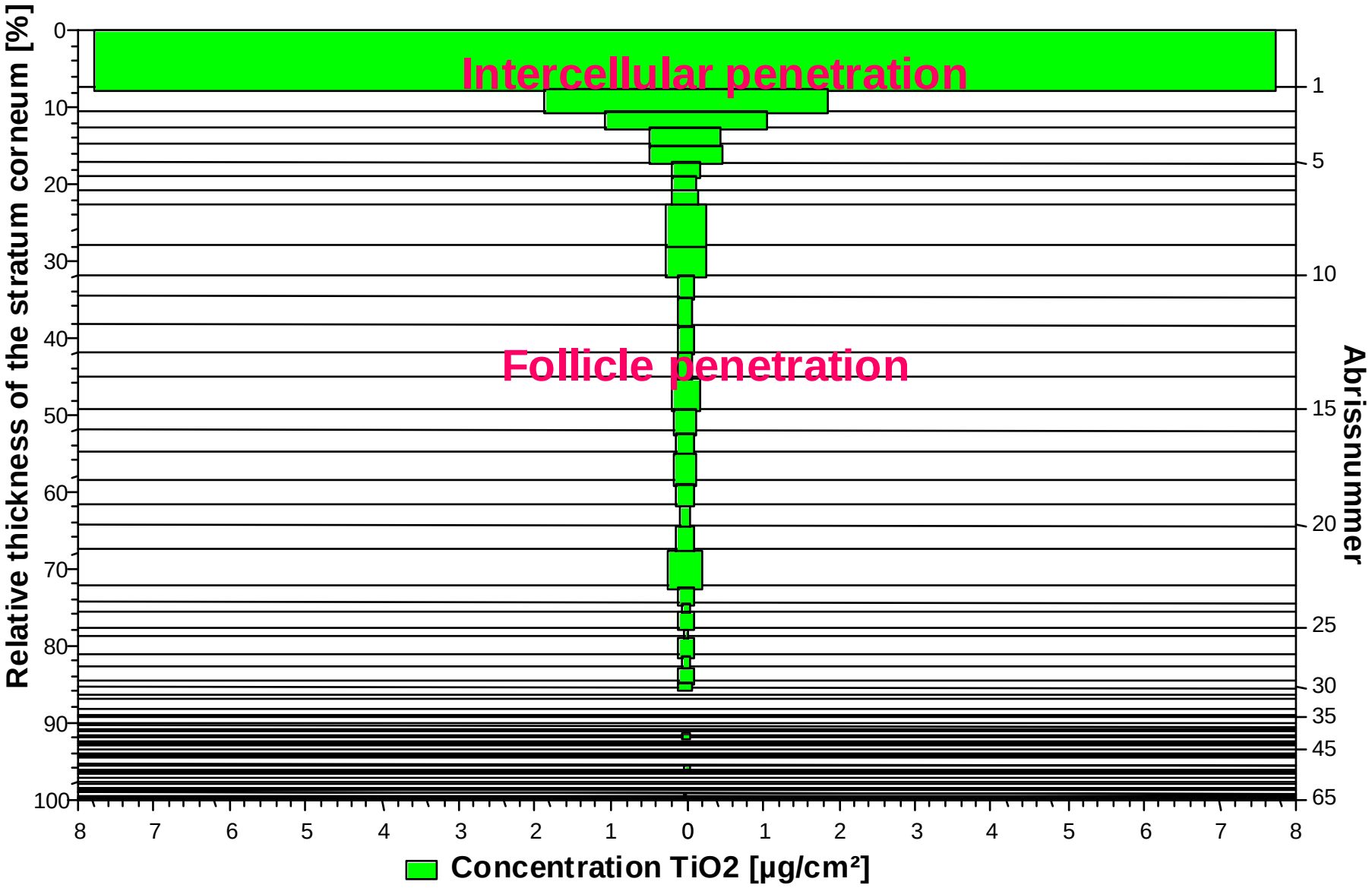


Detection of TiO_2 nanoparticles on the removed tape strips in the follicle areas

LSM measurements

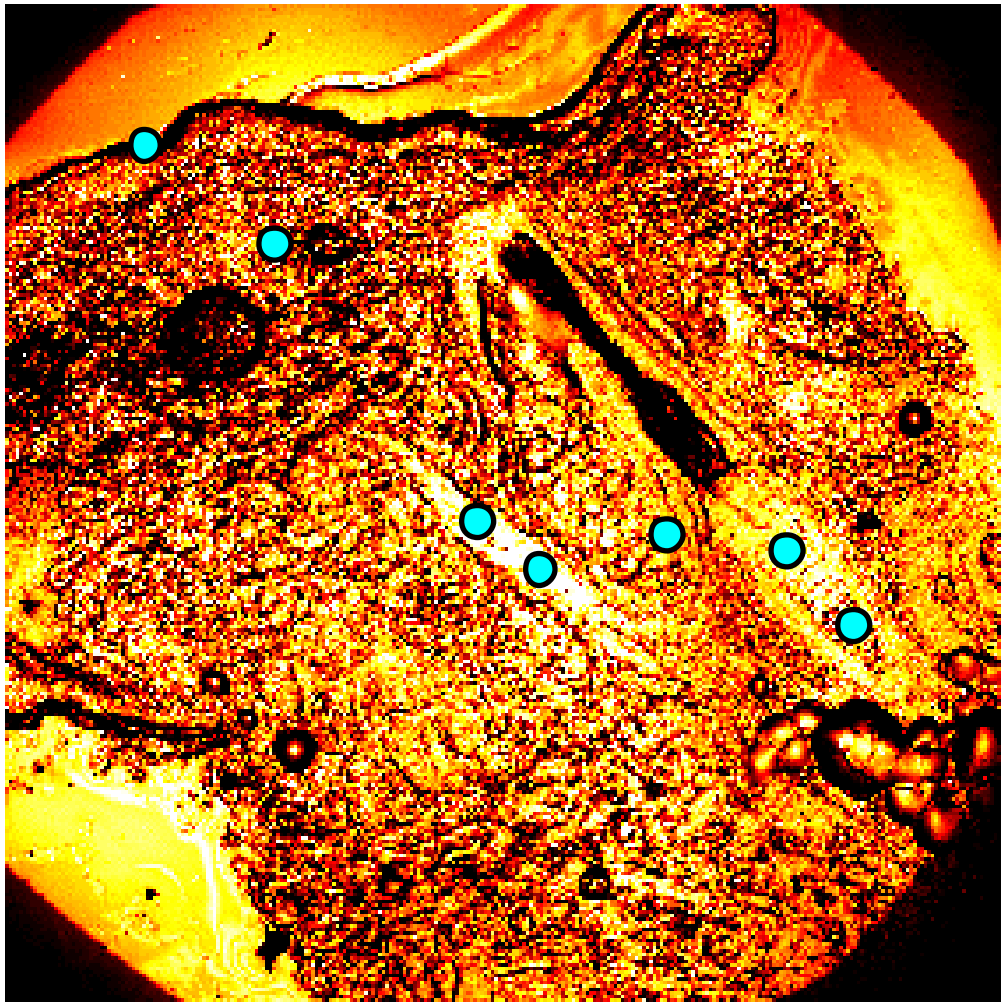


Penetration profile of TiO_2 in the stratum corneum



Characteristic measuring points of biopsy sample

diameter of the measuring spots 50 µm



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Transfollicular absorption

Unexpected results:

- The follicles are “open”, when hair growth and/or sebum production are detected. The follicles are “closed”, when **no** hair growth and **no** sebum production can be measured.

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What is the optimal size of NP for penetration into the hair follicles

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R. Toll et al., JID 2004

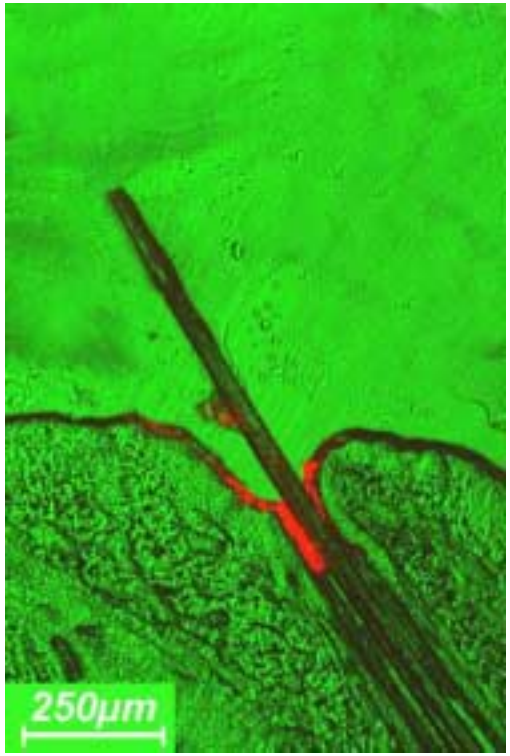
- human skin (in vitro)
- analysis of histological sections by LSM after application, penetration and massage of NP
- size: 600 - 2500 nm

J. Lademann et al., Skin. Pharm. will be published

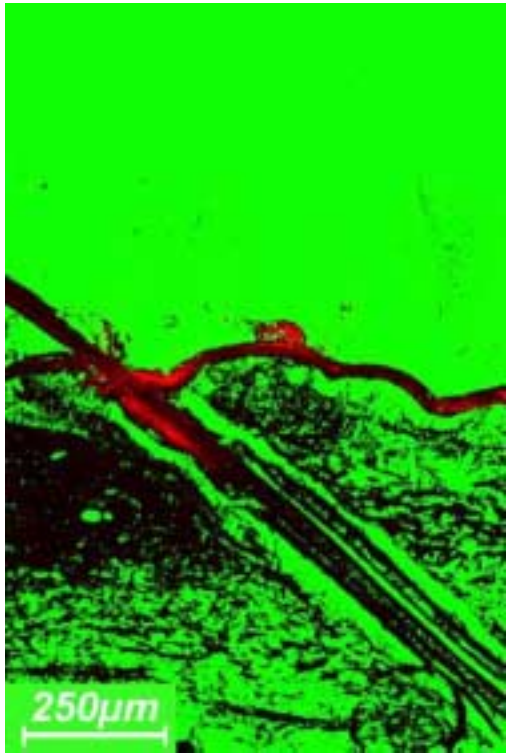
- pig ear skin (in vitro)
- analysis of histological sections by LSM after application and massage of NP containing formulation and formulation without NP
- size NP: 320 nm

Determination of the penetration depth

a) Without massage

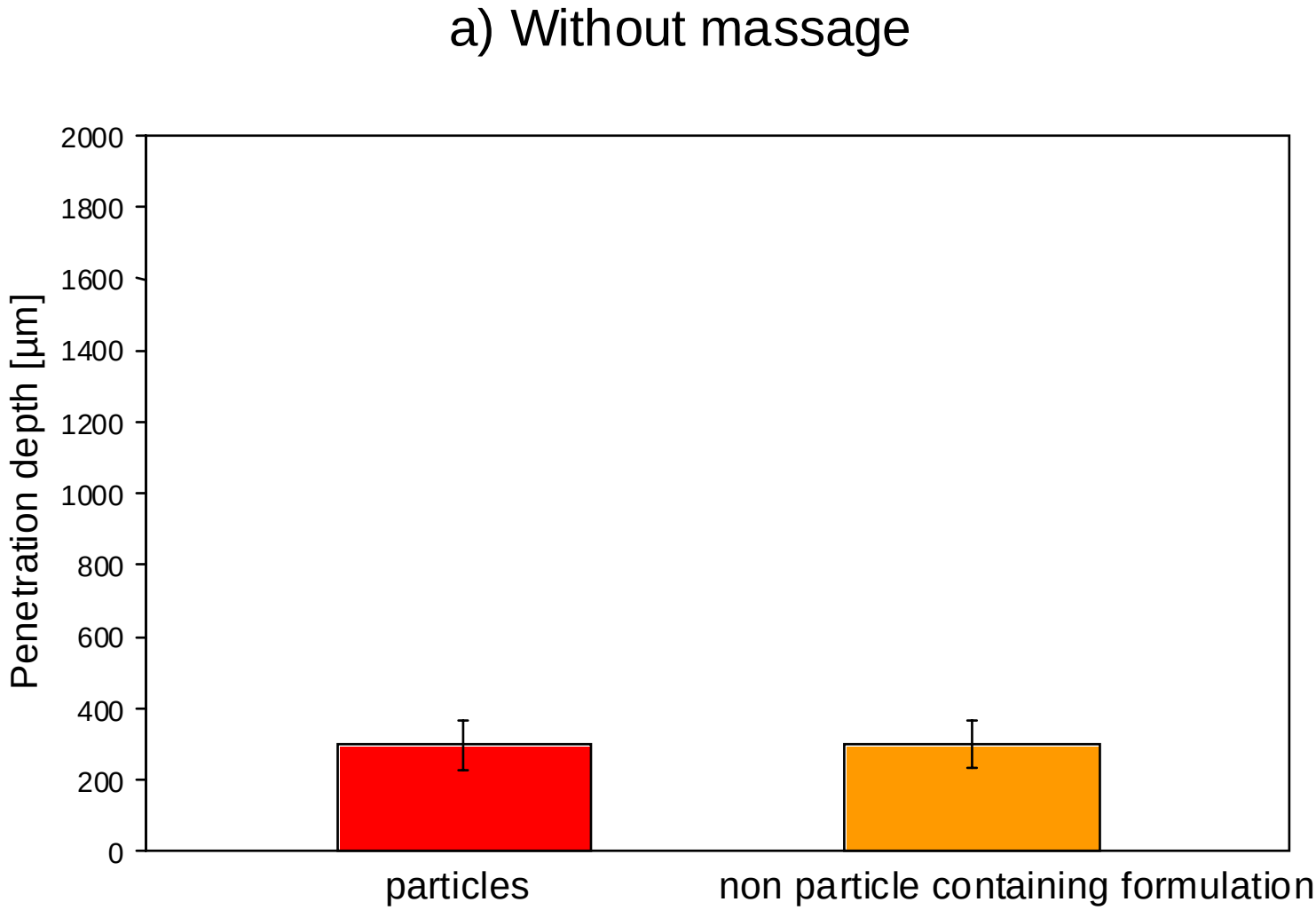


particles



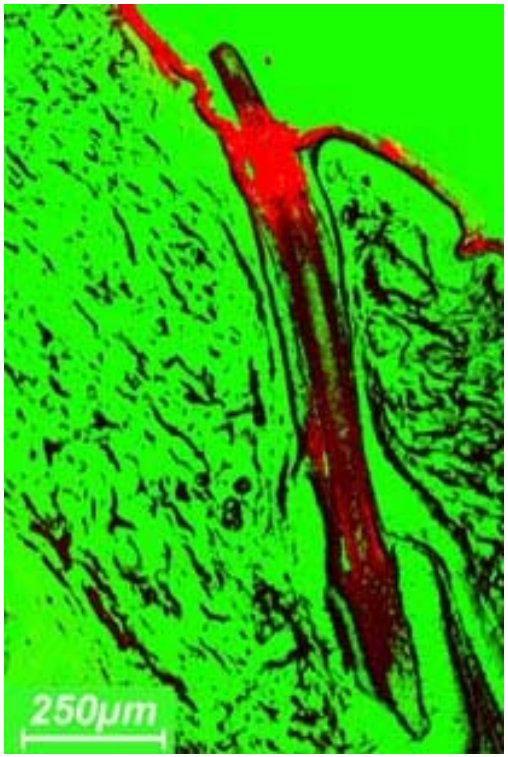
non particle containing formulation

Determination of the penetration depth

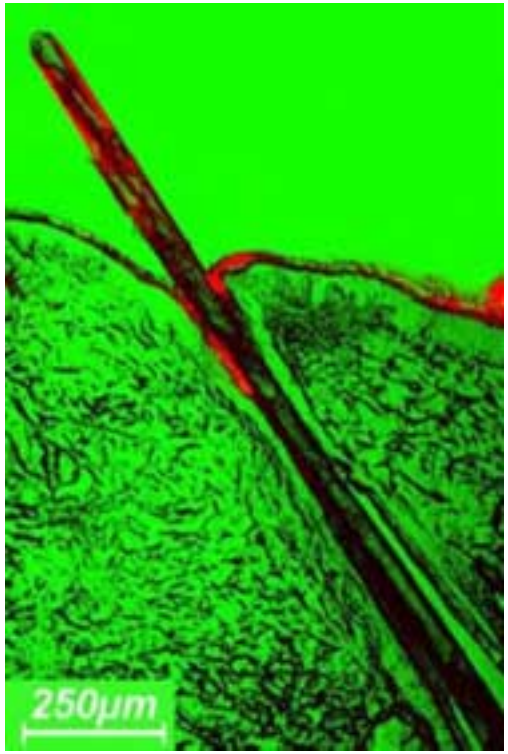


Determination of the penetration depth

a) With massage



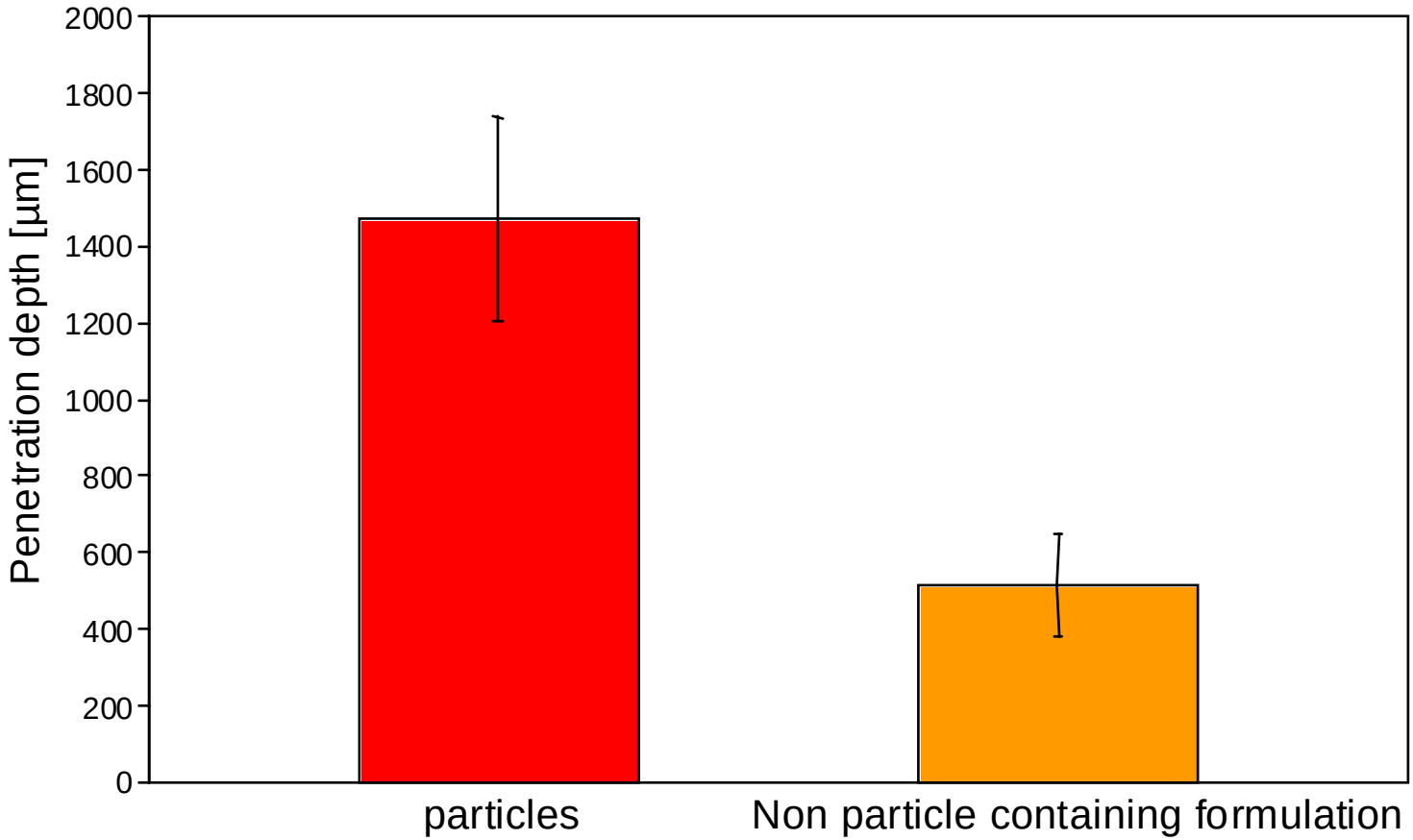
particles



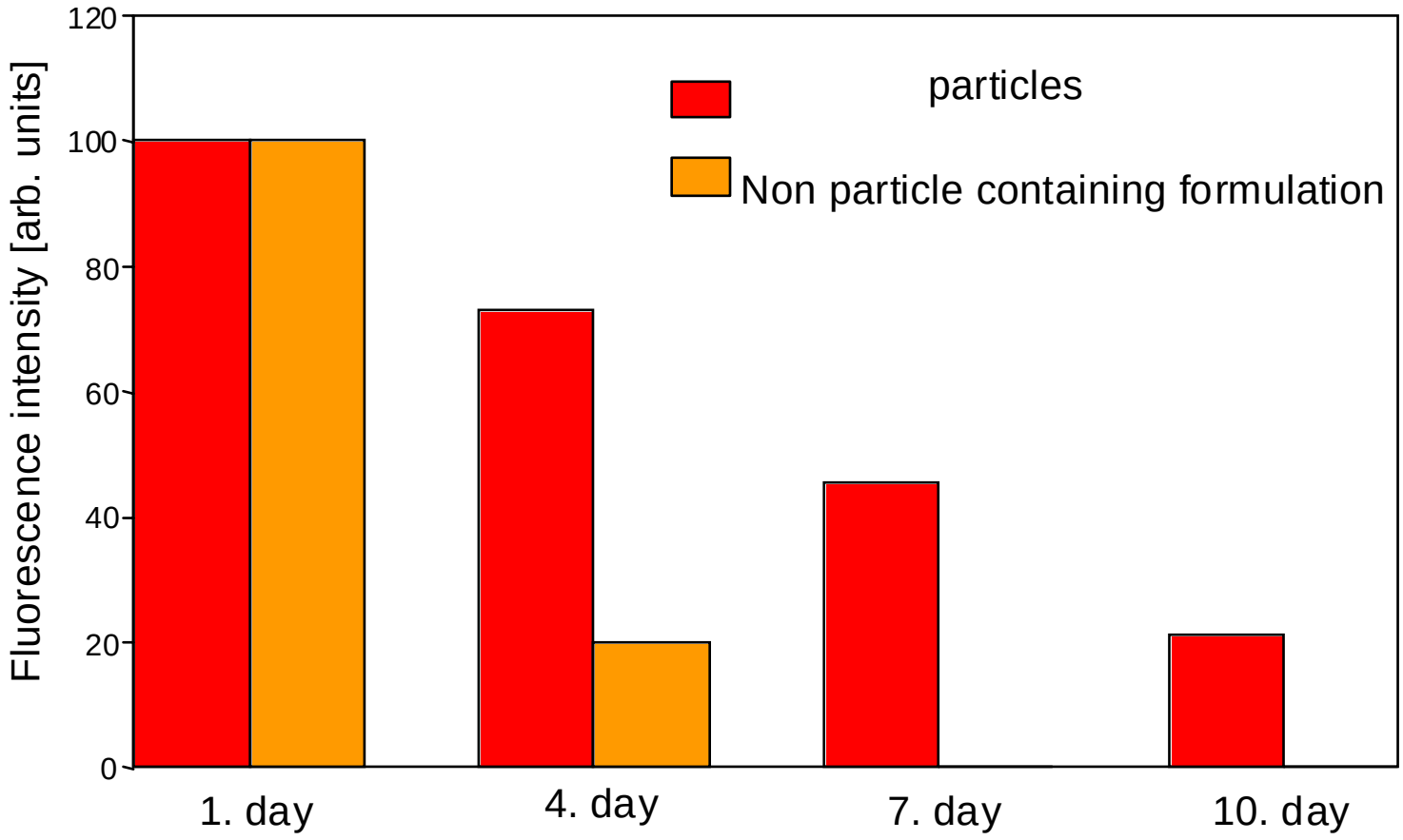
Non particle containing formulation

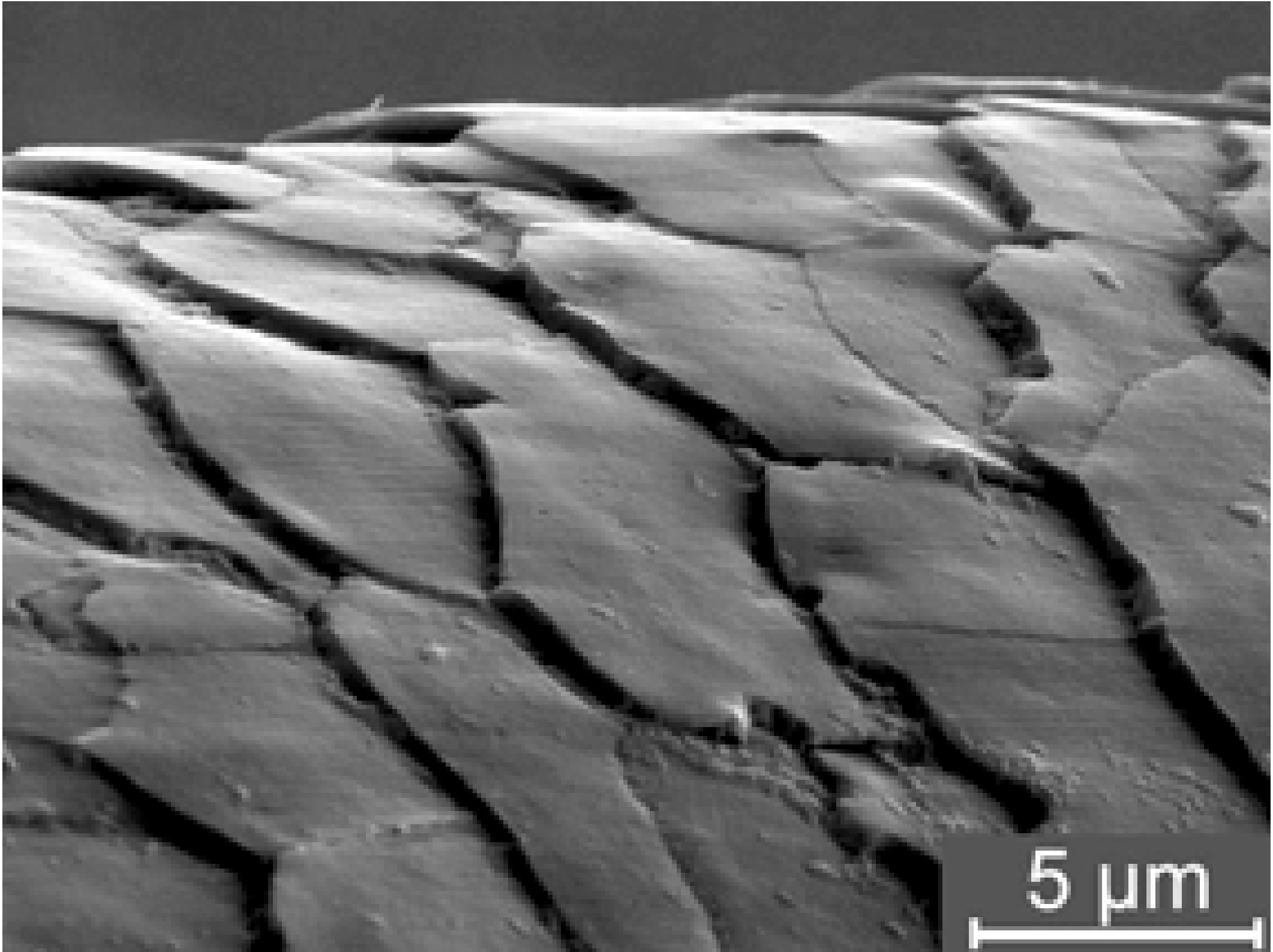
Determination of the penetration depth

a) With massage



Quantitative determination of the penetration depth




5 µm

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Resume

- The optimal size of NP for storage and penetration of NP is 300 – 700 nm
- No penetration into the living epidermis could be detected