

GLOBAL R&D



USING IN-VIVO RAMAN SPECTROSCOPY TO MEASURE THE DELIVERY OF ACTIVES AND THEIR EFFECT

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UNILEVER DISCOVER

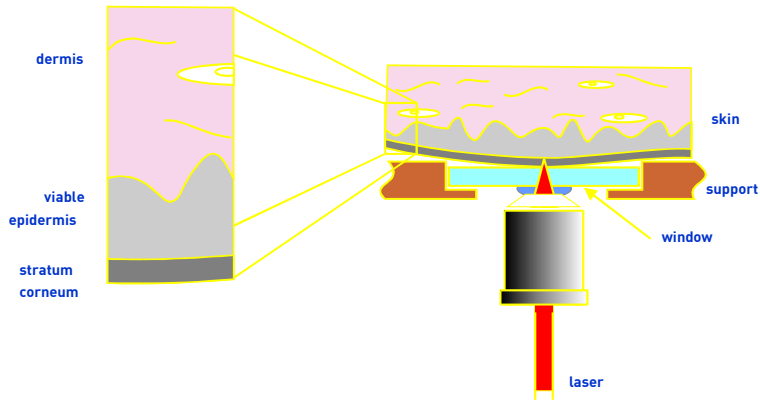


OUTLINE



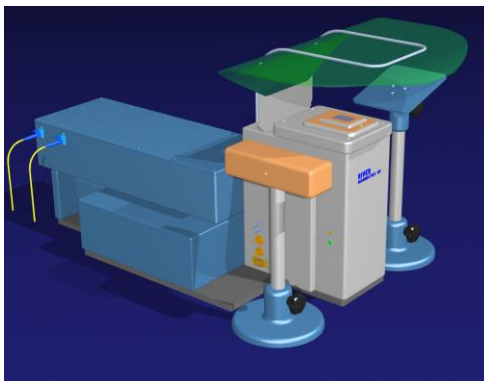
- The in-vivo Raman Experiment
- Penetration of actives into skin
- 'Difficult' areas of the body
- Scalp-Dandruff
 - Effect of ZnPTO based shampoo
- Summary

IN-VIVO RAMAN: THE CONFOCAL RAMAN EXPERIMENT



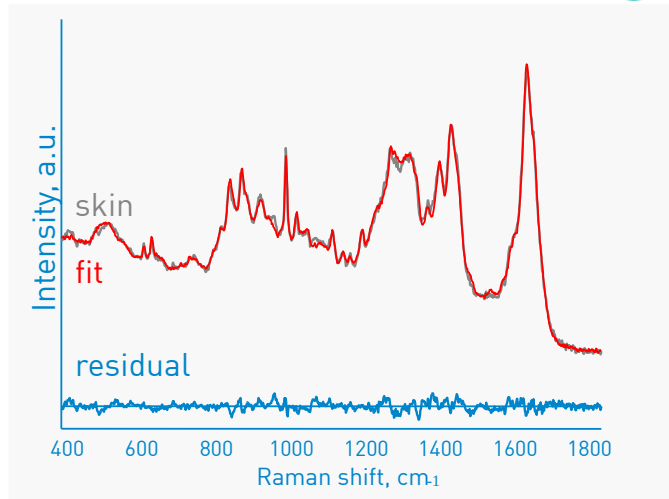
Raman spectra are collected at different depths confocally, in this case through the stratum corneum into the viable epidermis.

THE SKIN SPECTROMETER

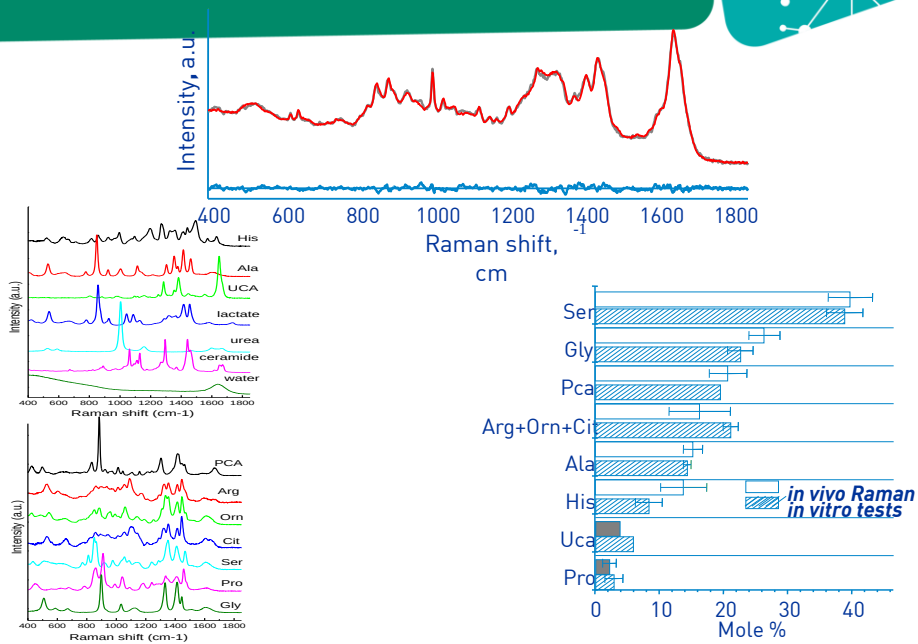


STRATUM CORNEUM – RAMAN SPECTRUM

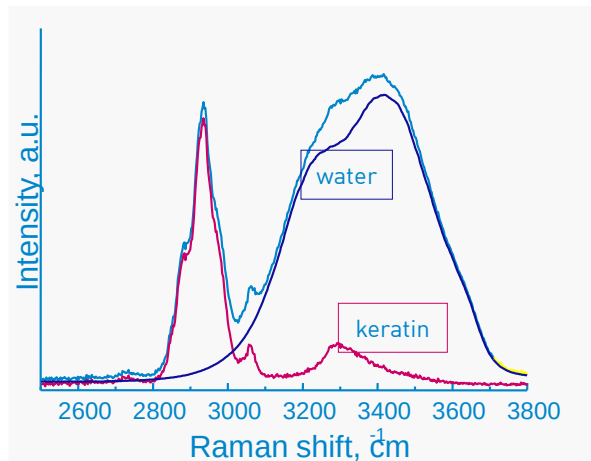
FINGERPRINT REGION (400-1800 cm^{-1})



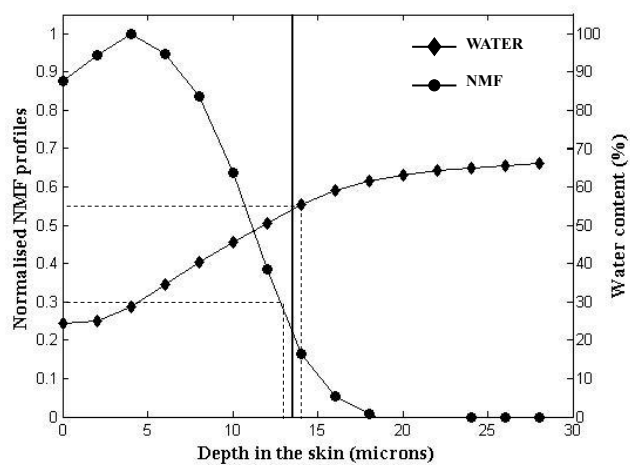
STRATUM CORNEUM – *IN-VIVO* CONFOCAL RAMAN SPECTRA OF COMPONENTS AND VALIDATION



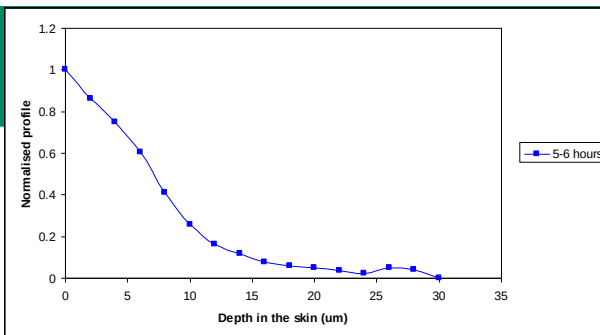
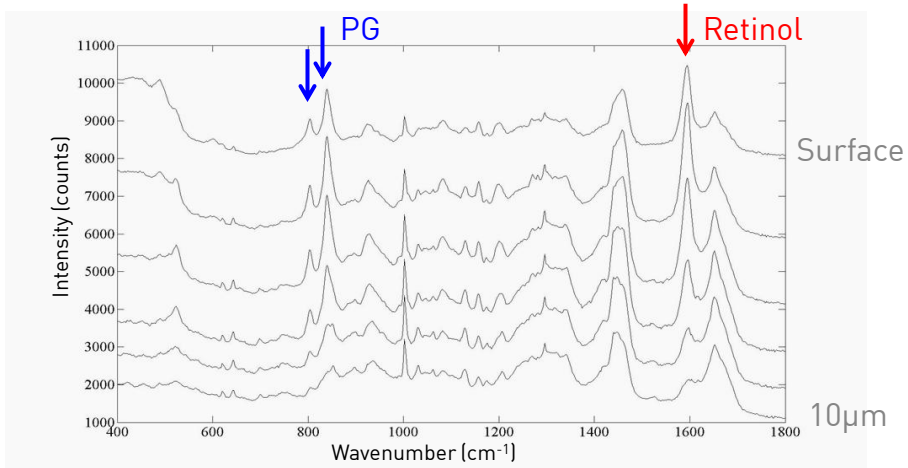
DETERMINATION OF WATER CONCENTRATION STRATUM CORNEUM



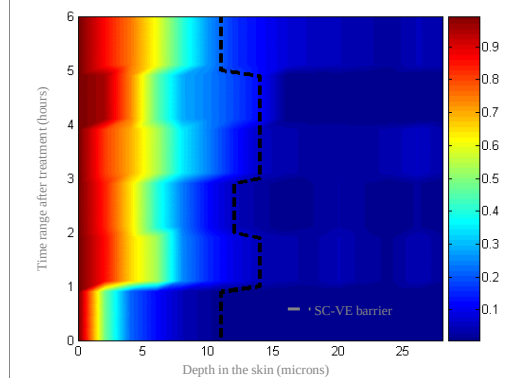
PLOT WITH DEPTH OF NMF AND WATER

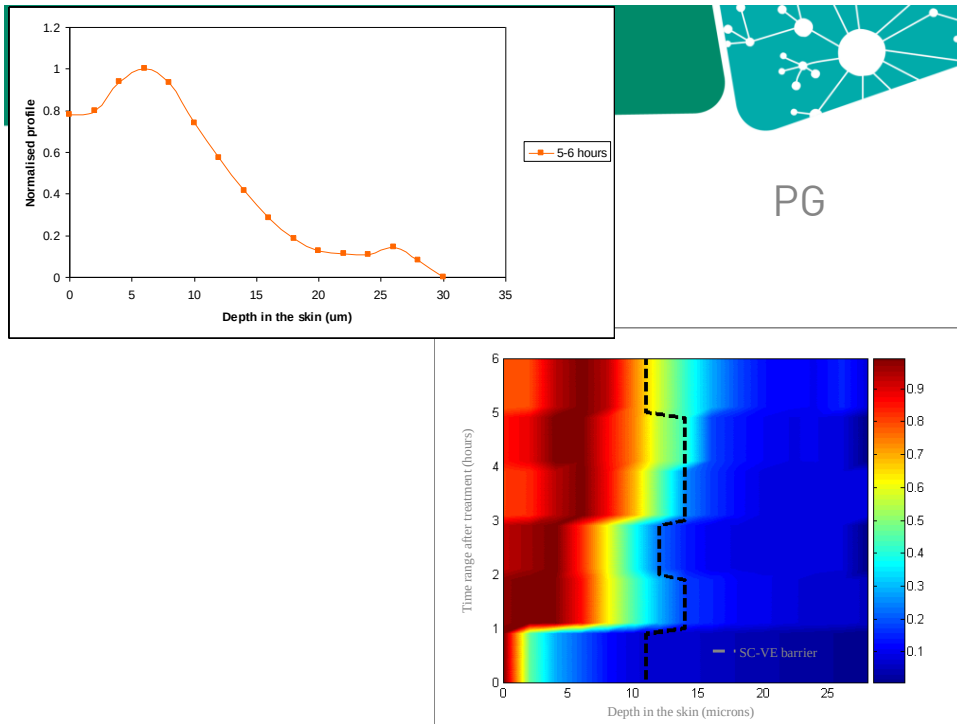


SKIN WITH RETINOL DELIVERED BY PG/ETHANOL

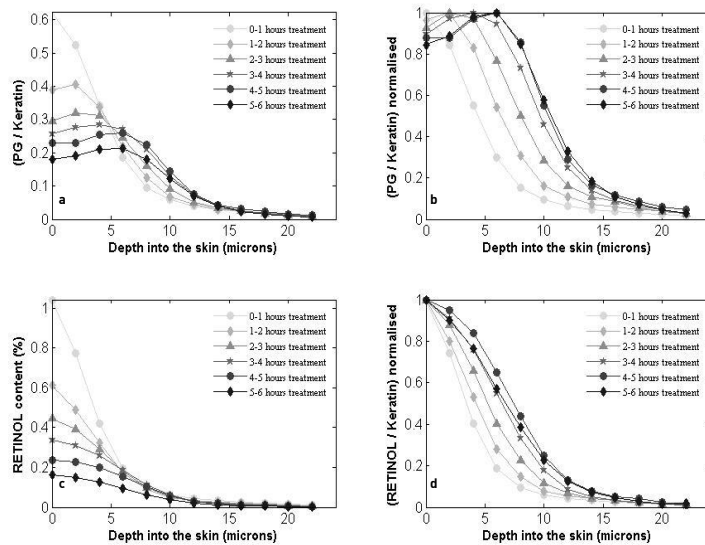


RETINOL
From retinol/PG/ethanol

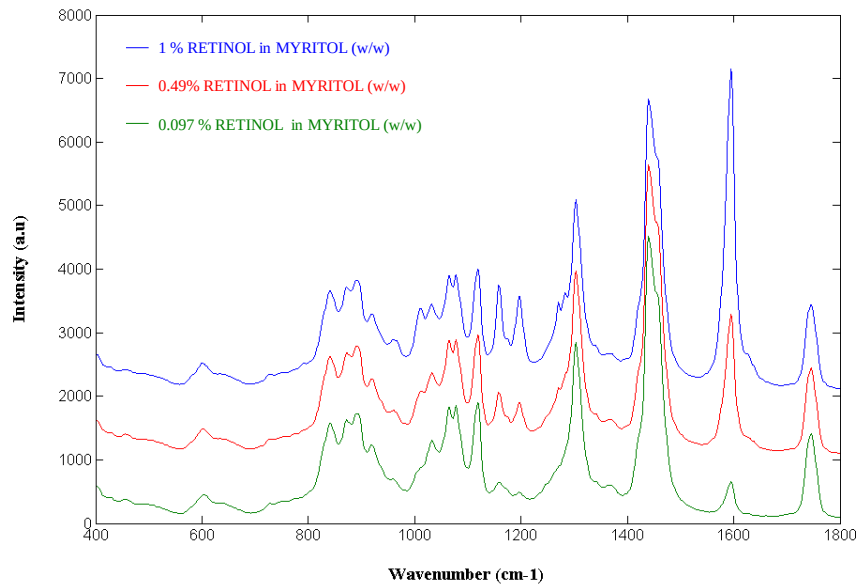




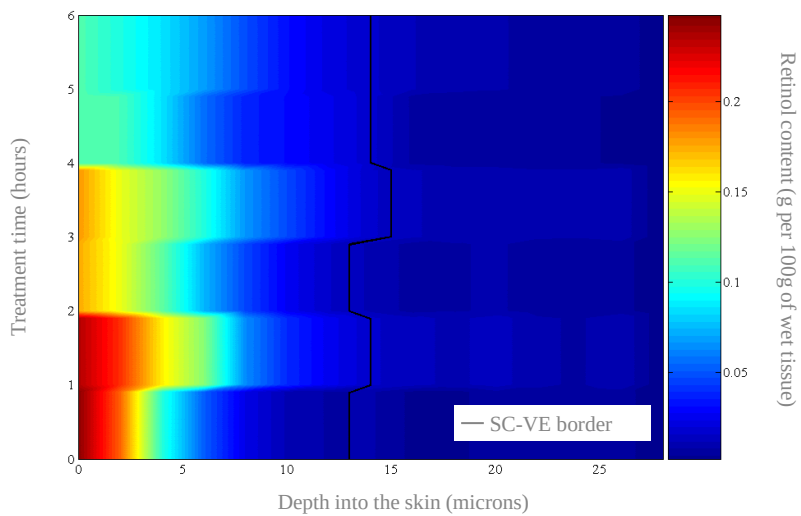
RETINOL/PG/ETHANOL



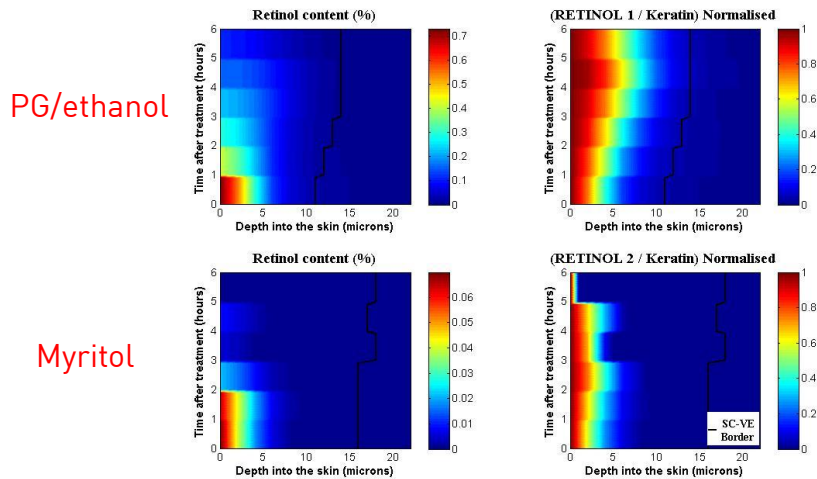
QUANTIFICATION IN THE SKIN



QUANTIFIED PENETRATION OF RETINOL



RETINOL DELIVERY FROM TWO DIFFERENT SYSTEMS



Retinol content quantitative (g per 100g of wet tissue)

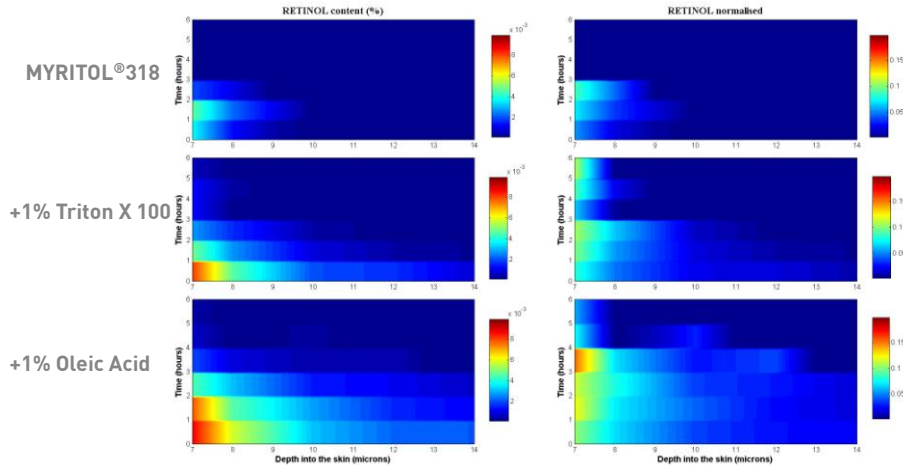
EFFECT OF PENETRATION ENHANCERS



Two different enhancers added to Myritol that act by different mechanisms

- Oleic acid: 'lipid fluidiser'
- Triton-X-100: 'lipid extractor'

PENETRATION ENHANCERS 0.3 % *TRANS*-RETINOL IN MYRITOL®318



OTHER BODY AREA'S OF INTEREST



THE 'PROBLEM'



- Not all areas of skin are the same

Some area's are not that well characterised

- It is difficult to measure all areas of interest

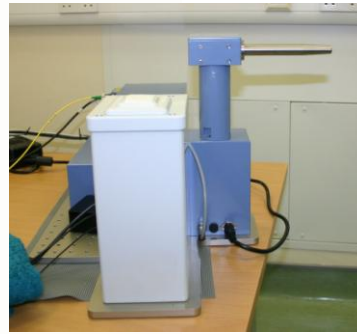
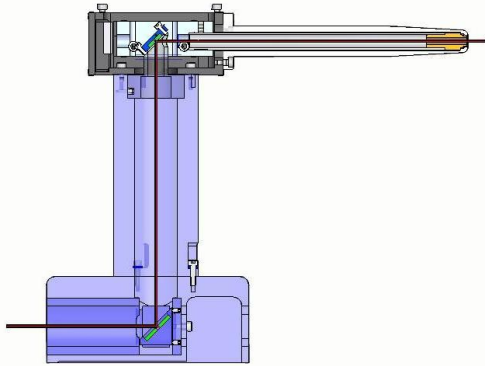
Scalp, Axilla

SCALP IS SKIN BUT IT IS UNIQUE

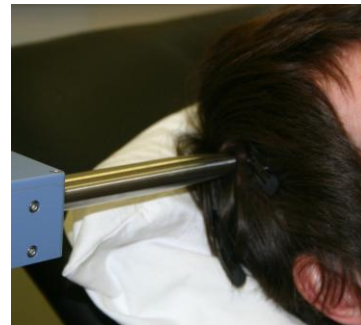


- Scalp has the highest concentration of terminal hair on the body
 - Up to 25% of our body's hair is found on the scalp
- Due to the high level of terminal hair, scalp has a high concentration of sebaceous glands (and high sebum)
- Furthermore, high level of terminal hair results in higher humidity at the scalp surface
- Scalp has more layers of corneocytes than face skin but fewer than forearm
- Therefore likely to be different and behave differently

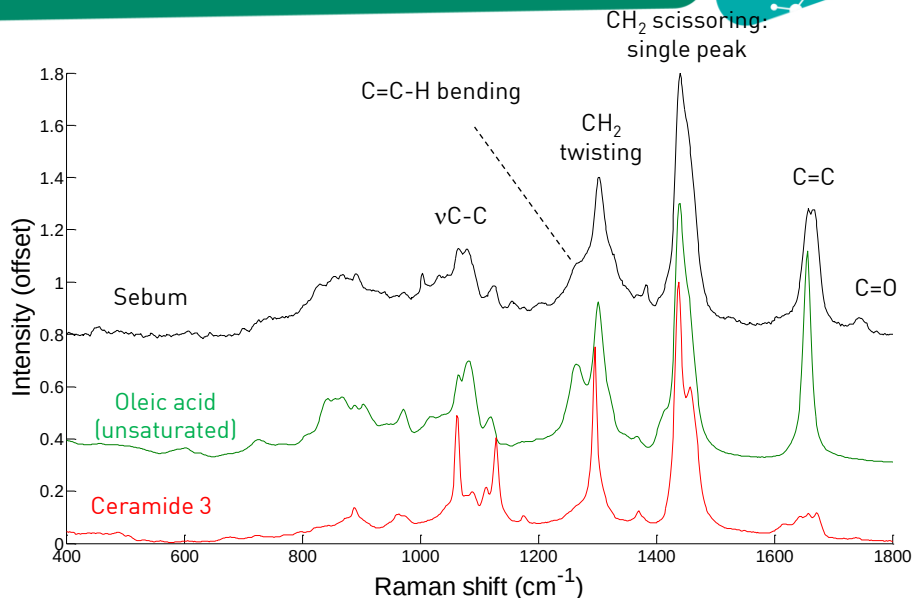
THE NEW *IN-VIVO* RAMAN PROBE



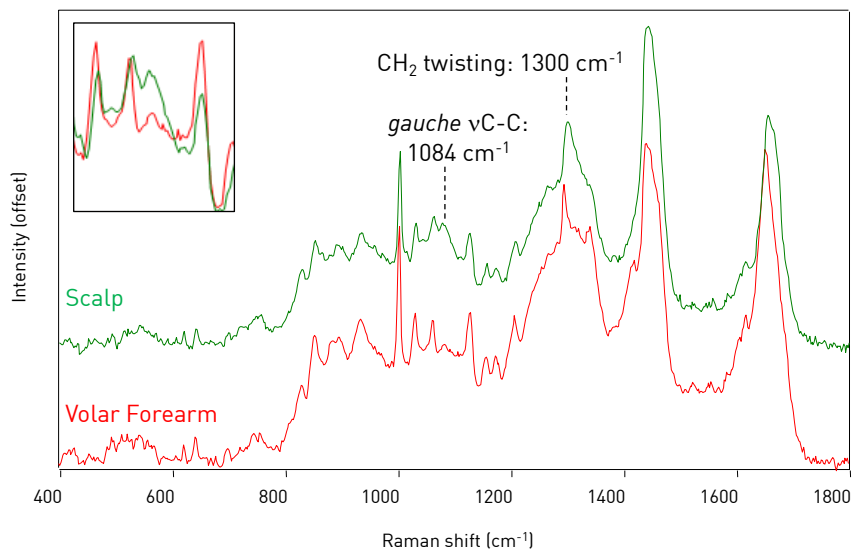
SCALP



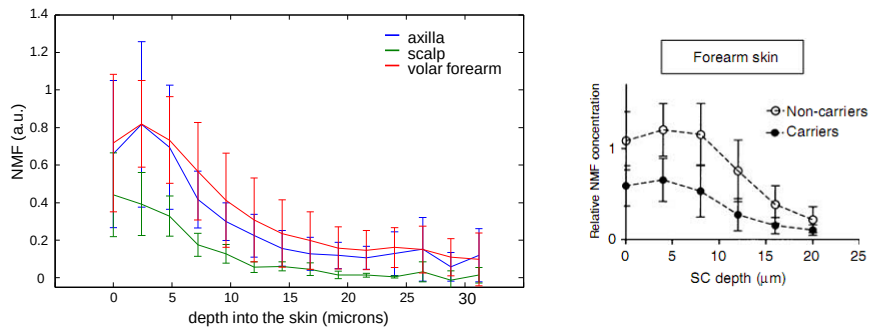
SPECTRAL CHARACTERISTICS OF THE SCALP : SEBUM



SPECTRAL CHARACTERISTICS OF YOUR SCALP

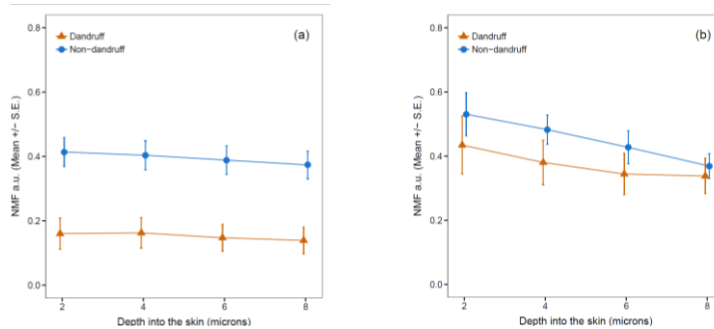


NMF LEVELS ON DIFFERENT BODY SITES



Kezic, J et al Invest Dermatol (2008)

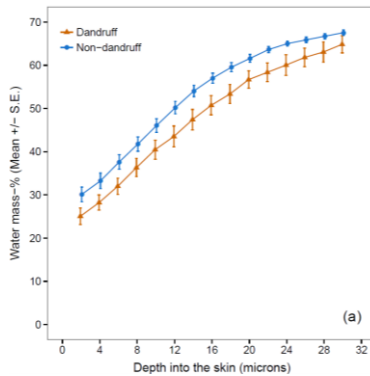
DANDRUFF SCALP-BEFORE AND AFTER ZNPTO



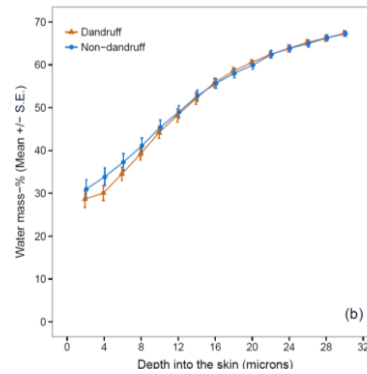
Average NMF profiles in the skin for dandruff and non-dandruff groups at baseline (23 subjects each group)

After 6 weeks ZnPTO shampoo

DANDRUFF SCALP-BEFORE AND AFTER ZNPTO



Average water profiles for the dandruff and non-dandruff groups at baseline



After 6 weeks ZnPTO shampoo use

SUMMARY



- Raman can be used *in-vivo* to look at the inherent skin and added components with depth and time.
- The effect of different delivery vehicles and penetration enhancers can be clearly seen
- A new probe can be used on 'difficult' body sites
- Shows new insights on these skin sites
- Dandruff has been studied and effect of ZnPTO observed



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