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## **Lipid model membrane systems as a tool for unraveling the underlying factors for skin barrier dysfunction**

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## REFERENCES

1. Elias, P. M., Stratum corneum defensive functions: an integrated view. *J. Invest. Dermatol.* **2005**, *125* (2), 183-200.
2. Baroni, A.; Buommino, E.; De Gregorio, V.; Ruocco, E.; Ruocco, V.; Wolf, R., Structure, and function of the epidermis related to barrier properties. *Clin. Dermatol.* **2012**, *30* (3), 257-62.
3. Madison, K. C., Barrier function of the skin: "la raison d'être" of the epidermis. *J. Invest. Dermatol.* **2003**, *121* (2), 231-41.
4. Bodde, H. E.; Kruithof, M. A. M.; Brussee, J.; Koerten, H. K., Visualization of normal and enhanced HgCl<sub>2</sub> transport through human-skin invitro. *Int. J. Pharm.* **1989**, *53* (1), 13-24.
5. Talreja, P. S.; Kleene, N. K.; Pickens, W. L.; Wang, T. F.; Kasting, G. B., Visualization of the lipid barrier and measurement of lipid pathlength in human stratum corneum. *AAPS Pharmsci.* **2001**, *3* (2), art. no. 13.
6. Proksch, E.; Brandner, J. M.; Jensen, J. M., The skin: an indispensable barrier. *Exp. Dermatol.* **2008**, *17* (12), 1063-72.
7. Bouwstra, J. A.; Gooris, G. S.; van der Spek, J. A.; Bras, W., Structural investigations of human stratum corneum by small-angle X-ray scattering. *J. Invest. Dermatol.* **1991**, *97* (6), 1005-12.
8. White, S. H.; Mirejovsky, D.; King, G. I., Structure of lamellar lipid domains and corneocyte envelopes of murine stratum corneum. An X-ray diffraction study. *Biochemistry* **1988**, *27* (10), 3725-32.
9. Bouwstra, J.; Gooris, G.; Ponec, M., The lipid organisation of the skin barrier: Liquid and crystalline domains coexist in lamellar phases. *Journal of biological physics* **2002**, *28* (2), 211-223.
10. Boncheva, M.; Damien, F.; Normand, V., Molecular organization of the lipid matrix in intact stratum corneum using ATR-FTIR spectroscopy. *Biochim. Biophys. Acta* **2008**, *1778* (5), 1344-55.
11. Damien, F.; Boncheva, M., The extent of orthorhombic lipid phases in the stratum corneum determines the barrier efficiency of human skin in vivo. *J. Invest. Dermatol.* **2010**, *130* (2), 611-614.
12. Weerheim, A.; Ponec, M., Determination of stratum corneum lipid profile by tape stripping in combination with high-performance thin-layer chromatography. *Arch. Dermatol. Res.* **2001**, *293* (4), 191-199.
13. Coderch, L.; López, O.; de la Maza, A.; Parra, J. L., Ceramides and Skin Function. *Am. J. Clin. Dermatol.* **2003**, *4* (2), 107-129.
14. Norlen, L.; Nicander, I.; Lundsjo, A.; Cronholm, T.; Forslind, B., A new HPLC-based method for the quantitative analysis of inner stratum corneum lipids with special reference to the free fatty acid fraction. *Arch. Dermatol. Res.* **1998**, *290* (9), 508-16.
15. van Smeden, J.; Boiten, W. A.; Hankemeier, T.; Rissmann, R.; Bouwstra, J. A.; Vreeken, R. J., Combined LC/MS-platform for analysis of all major stratum corneum lipids, and the profiling of skin substitutes. *Biochim. Biophys. Acta* **2014**, *1841* (1), 70-79.
16. P. W. Wertz, D. T. D., *Physiology, biochemistry and molecular biology of the skin*. second ed.; Oxford University Press: New York, 1991; Vol. 1, p 205-236.
17. Masukawa, Y.; Narita, H.; Shimizu, E.; Kondo, N.; Sugai, Y.; Oba, T.; Homma, R.; Ishikawa, J.; Takagi, Y.; Kitahara, T.; Takema, Y.; Kita, K., Characterization of overall ceramide species in human Stratum corneum. *J. Lipid Res.* **2008**, *49* (7), 1466-1476.

18. Rabionet, M.; Gorgas, K.; Sandhoff, R., Ceramide synthesis in the epidermis. *Biochim. Biophys. Acta* **2014**, *1841* (3), 422-34.
19. Robson, K. J.; Stewart, M. E.; Michelsen, S.; Lazo, N. D.; Downing, D. T., 6-Hydroxy-4-sphingenine in human epidermal ceramides. *J. Lipid Res.* **1994**, *35* (11), 2060-8.
20. Stewart, M. E.; Downing, D. T., A new 6-hydroxy-4-sphingenine-containing ceramide in human skin. *J. Lipid Res.* **1999**, *40* (8), 1434-9.
21. van Smeden, J.; Hoppel, L.; van der Heijden, R.; Hankemeier, T.; Vreeken, R. J.; Bouwstra, J. A., LC/MS analysis of stratum corneum lipids: ceramide profiling and discovery. *J. Lipid Res.* **2011**, *52* (6), 1211-21.
22. Boiten, W.; Absalah, S.; Vreeken, R.; Bouwstra, J.; van Smeden, J., Quantitative analysis of ceramides using a novel lipidomics approach with three dimensional response modelling. *Biochimica et Biophysica Acta (BBA) - Molecular and Cell Biology of Lipids* **2016**, *1861* (11), 1652-1661.
23. Janssens, M.; van Smeden, J.; Gooris, G. S.; Bras, W.; Portale, G.; Caspers, P. J.; Vreeken, R. J.; Kezic, S.; Lavrijsen, A. P.; Bouwstra, J. A., Lamellar lipid organization and ceramide composition in the stratum corneum of patients with atopic eczema. *J. Invest. Dermatol.* **2011**, *131* (10), 2136-8.
24. van Smeden, J.; Janssens, M.; Boiten, W. A.; van Drongelen, V.; Furio, L.; Vreeken, R. J.; Hovnanian, A.; Bouwstra, J. A., Intercellular skin barrier lipid composition, and organization in Netherton syndrome patients. *J. Invest. Dermatol.* **2014**, *134* (5), 1238-1245.
25. Schreiner, V.; Gooris, G. S.; Pfeiffer, S.; Lanzendorfer, G.; Wenck, H.; Diembeck, W.; Proksch, E.; Bouwstra, J., Barrier characteristics of different human skin types investigated with X-ray diffraction, lipid analysis, and electron microscopy imaging. *J. Invest. Dermatol.* **2000**, *114* (4), 654-60.
26. J.A. Bouwstra, E. H. M., *Cosmetic formulation principles and practice*. CRC Press: Boca Raton, 2019.
27. Crumrine, D.; Khnykin, D.; Krieg, P.; Man, M.-Q.; Celli, A.; Mauro, T. M.; Wakefield, J. S.; Menon, G.; Mauldin, E.; Miner, J. H.; Lin, M.-H.; Brash, A. R.; Sprecher, E.; Radner, F. P. W.; Choate, K.; Roop, D.; Uchida, Y.; Gruber, R.; Schmuth, M.; Elias, P. M., Mutations in Recessive Congenital Ichthyoses Illuminate the Origin and Functions of the Corneocyte Lipid Envelope. *J. Investig. Dermatol.* **2019**, *139* (4), 760-768.
28. Eckl, K.-M.; Tidhar, R.; Thiele, H.; Oji, V.; Hausser, I.; Brodesser, S.; Preil, M.-L.; Önal-Akan, A.; Stock, F.; Müller, D.; Becker, K.; Casper, R.; Nürnberg, G.; Altmüller, J.; Nürnberg, P.; Traupe, H.; Futerman, A. H.; Hennies, H. C., Impaired Epidermal Ceramide Synthesis Causes Autosomal Recessive Congenital Ichthyosis and Reveals the Importance of Ceramide Acyl Chain Length. *J. Investig. Dermatol.* **2013**, *133* (9), 2202-2211.
29. Motta, S.; Monti, M.; Sesana, S.; Caputo, R.; Carelli, S.; Ghidoni, R., Ceramide composition of the psoriatic scale. *Biochim. Biophys. Acta* **1993**, *1182* (2), 147-51.
30. Groen, D.; Gooris, G. S.; Bouwstra, J. A., New insights into the stratum corneum lipid organization by X-ray diffraction analysis. *Biophys. J.* **2009**, *97* (8), 2242-2249.
31. Uche, L. E.; Gooris, G. S.; Beddoes, C. M.; Bouwstra, J. A., New insight into phase behavior and permeability of skin lipid models based on sphingosine and phytosphingosine ceramides. *Biochim. Biophys. Acta* **2019**, *1861* (7), 1317-1328.

## CURRICULUM VITAE

Lorretta Uche was born on the 27th of February 1969 in Nigeria. She obtained a bachelor's degree in Pharmacy from the University of Nigeria Nsukka in 1991. Thereafter, she undertook a one-year internship program at the University of Nigeria Teaching Hospital Enugu in drug dispensing and compounding. Afterward, she did the mandatory one-year National Youth Service at the Essential Drugs division of the Ministry of Health and Social Welfare Port-Harcourt. She then worked as a community Pharmacist in New Life Care Pharmacy Port-Harcourt for two years.

In 1997 she obtained a master's degree in Pharmaceutical Technology (with distinction) from Kings College, London. Her dissertation investigated the effect of oil structure on microemulsion formation and was supervised by Prof. Jayne Lawrence. She was awarded the Abbott Laboratories Prize for best student in Pharmaceutical Technology and the College Prize for the best student from all of the Pharmacy Departments three MSc degrees. Thereafter, she joined Juhel Nigeria Limited, a pharmaceutical manufacturing company as a Production Pharmacist. In the year 2000, she was awarded the World Bank Robert S. McNamara Fellowship to investigate the Regulation of the Pharmaceutical industry in Nigeria. She worked in the Pharmaceutical industry for 15 years during which she gained experience in various sections including drug formulation, quality assurance, and regulatory affairs.

In 2017, she was admitted to a PhD position at Leiden Academic Centre for Drug Research, Leiden University under the supervision of Prof. Joke Bouwstra and Dr. Charlotte Beddoes. Her project focused on using lipid model membrane systems as a tool to unravel the underlying factors for skin barrier impairment in inflammatory skin diseases.

In November 2021, she was employed as Pharmaceutical Scientist, Manufacturing Science and Technology at Abbott laboratories, Weesp, Netherlands

## LIST OF PUBLICATIONS

Uche, L. E.; Gooris, G. S.; Beddoes, C. M.; Bouwstra, J. A., *New insight into phase behavior and permeability of skin lipid models based on sphingosine and phytosphingosine ceramides*. *Biochim. Biophys. Acta*, **2019**; 1861(7): p. 1317-1328.

Uche, L. E.; Gooris, G. S.; Bouwstra, J. A.; Beddoes, C. M., *Barrier Capability of Skin Lipid Models: Effect of Ceramides and Free Fatty Acid Composition*, *Langmuir*, **2019**; 26;35(47):15376-15388

Uche, L. E.; Gooris, G. S.; Bouwstra, J. A.; Beddoes, C. M., *High concentration of the ester-linked  $\omega$ -hydroxy ceramide increases the permeability in skin lipid model membranes*, *Biochim. Biophys. Acta*, **2021**; 1863(1): p. 183487-183497.

Uche, L. E.; Gooris, G. S.; Bouwstra, J. A.; Beddoes, C. M., *Increased Levels of Short-Chain Ceramides Modify the Lipid Organization and Reduce the Lipid Barrier of Skin Model Membranes*, *Langmuir* **2021**; 37 (31), 9478-9489.