

Lamellar structures of ceramide:fatty acid mixtures

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The main barrier toward transepidermal water loss and external xenobiotic aggression is the lipid-filled extracellular space of the cornified part of the epidermis, the stratum corneum (SC). Several skin diseases seem to be associated with changes in the chemical composition of the lipid matrix of the SC resulting in a change of the normal structure of the lipid barrier with negative consequences for its permeation properties.

Ceramides alone or mixed with fatty acids and cholesterol in excess water are often arranged in lamellar crystal structures [1,2] and our hypothesis was that in such crystals the ionized fatty acid should be located at the surface in contact with water. This limits the number of layers per stack creating repetitive structures delimited by the available fatty acid. As predicted, our preparations of N-palmitoyl-D-erythro-sphingosine (C16-Cer) with 30 mol% palmitic acid (PA) at pH 9.0 and 20 °C produced sharp diffractions at $s = 0.163 \text{ nm}^{-1}$, besides the usual C16-Cer reflection at $s = 0.083 \text{ nm}^{-1}$, Figure 1.

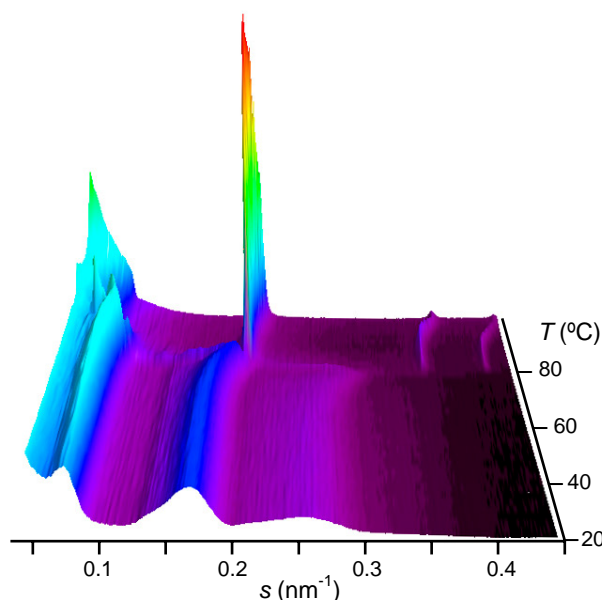


Figure 1: SAXS of a mixture of C16-Cer:PA 70:30 at pH 9.

The peak at 0.083 nm^{-1} is strongly sensitive to the ionic strength of the aqueous media while that at 0.163 nm^{-1} is practically non sensitive to the characteristics of the aqueous media indicating that the thick lamellae have a ionic surface.

References

- [1] S.L. Souza, M.J. Capitan, J. Alvarez, S.S. Funari, M.H. Lameiro, and E. Melo, *J. Phys. Chem. B* **113**, 1367 (2009).
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