Molecular skin effects of blue light exposure: characterization of epidermal lipidome by normal-phase high-performance liquid chromatography coupled with high-resolution mass spectrometry.

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Lifestyle changes associated with the intensive use of digital tools lead to increased exposure to artificial screen light, especially blue light.

The possible effects of blue light exposure on the skin can vary depending on its intensity and wavelength, potentially causing harm, or providing benefits. Several studies highlight the effects of blue light on the macromolecular mechanical properties and the skin barrier function. Although clinical studies are more likely to provide information on the short-term effects of blue light exposure, the full understanding of the biological effects of repeated and/or longer-term exposure is not yet clear.

The purpose of this study is to determine the molecular impact of blue light exposure on the lipid composition of the reconstructed human epidermis (RHE).

In order to achieve this, RHE samples, imitating *in vivo* conditions, were repeatedly exposed to two wavelengths (415 and 455 nm) at different doses during several days of maturation (from day 14 to day 20).

The complex composition and organization of lipid classes and subclasses such as ceramides, glucosylceramides, sphingomyelins, cholesterol, and free fatty acids, are responsible for the key role of epidermal lipids in skin barrier function.

Lipid extracts from control and exposed RHE samples were analyzed by normal-phase high-performance liquid chromatography coupled with high-resolution mass spectrometry NP-HPLC /HR-MS^n. This technique allows separation of lipid classes of different polarity in a single analysis, permitting the characterization of their fine structures. It was observed that the effect of blue light induces significant changes in lipid profiles over time, depending on the applied dose and maturation day. These results provide valuable insights into lipid metabolism that could aid in the detection of skin barrier dysfunction.

The approach developed in this study provides an additional source of information regarding the effects of blue light. It may also facilitate the evaluation of the efficacy of protective and/or regenerative agents.

Keywords: Reconstructed Human Epidermis, Lipids, Blue Light, NP-HPLC/HR-MS^n.