IMPACT OF BLUE LIGHT ON SKIN CELLS

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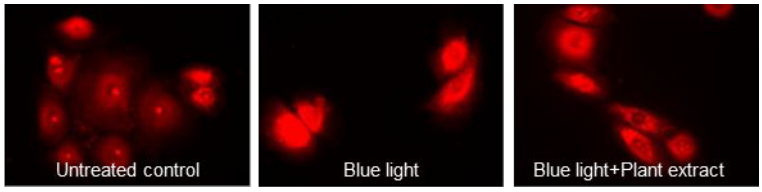
Summary:
Impact of light on the skin is today well known to accelerate the aging process. Recent advances highlighted the role of visible light [1] and especially the blue light part (400-500nm) in skin aging as we are constantly exposed to the blue light from electronic devices and because it is the highest energetic and most penetrating wavelength of the visible light. In this study, we demonstrated that blue light (BL) may induce oxidative stress, may be responsible for skin dehydration and may disturb the circadian rhythm of the skin.
To study the oxidative stress, the level of mitochondrial reactive oxygen species (ROS) was quantified by MitoSOX staining on culture of keratinocytes (epidermis cells) exposed to BL (447nm, 45J/cm^2). The effect of BL (455nm, 85J/cm^2) was also quantified on human skin explants by immunostaining of aquaporin-3 protein (a water channel of the epidermis) and MMP1 (matrix metalloproteinase 1). The disturbing effect of BL on skin circadian rhythm was evaluated by measuring the gene expression level of *CRY1* (cryptochrome 1) and *PER1* (period 1) by qPCR in BL-exposed keratinocytes (447nm, 20J/cm^2). Plant extracts were evaluated for their protective potential.

Mitochondrial oxidative stress: We first showed that BL increased the mitochondrial ROS production in keratinocytes and that 0.05% of a plant extract (*Dendrobium officinale*) provided a significant protection by 70% against this induction (Figure 1).

Fig. 1 Visualization of the induction of mitochondrial ROS level (in red) by blue light and preventive effect of the plant extract in keratinocytes



Hydration: BL decreased by 78% AQP-3 protein level in skin explants, but the plant extract also significantly compensated this induction by 95%.

Circadian rhythm and extracellular matrix protection: We demonstrated that *PER1* and *CRY1* gene expression was decreased whereas MMP1 was increased in BL-exposed keratinocytes and skin explants respectively. A *Cistus monspeliensis* extract at 0.01% significantly protected by 60% and 70% respectively the *CRY1* & *PER1* gene expression increase and fully compensated the MMP1 induction.

To conclude we showed that blue light strongly impacts mitochondrial ROS production, extracellular matrix, skin hydration and circadian clock contributing to premature skin aging signs [2-4]. We also evidenced the *in vitro* efficacy of plant extracts that could advantageously prevent these phenomena.

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