Dermalux LED Phototherapy

Dr Simon Ravichandran discusses the use of LED phototherapy for the treatment of photo-ageing

LED phototherapy is a novel non-ablative and non-thermal treatment in the management of a wide variety of skin conditions. Unlike LASER therapy, that uses the principle of selective photothermolysis to induce a thermal injury, LEDs operate under the principle of photobiomodulation to influence cellular metabolic processes with a range of therapeutic indications. Medical LEDs are typically referred to by the colour of the light they emit and traditionally have been in the blue, yellow, red and near-infrared spectrum. The process of photobiomodulation is a result of photons being absorbed by molecules in the mitochondria or in the cell membrane of a target tissue called chromophores. The absorption results in a series of cellular signalling pathways that can up-regulate or down-regulate various cellular processes.[1] Different wavelengths of light have been shown to have specific actions, and also penetrate tissues to different depths.[2] As with LASER therefore, an appropriate wavelength needs to be chosen for a specific indication, and an understanding of the cellular processes involved will assist in selection.

Photo-ageing

The first skin changes that occur with age tend to present in the late twenties onwards, with wrinkling, pigmentation and fine telangectasia developing early, followed by increased skin laxity, epidermal thickening and keratoses occurring in later decades. Several intrinsic and extrinsic factors play a role in this, but prolonged exposure to sunlight is felt to be a major contributing factor. Ultraviolet light of <400nm wavelength (UVA) is known to down-regulate the production of collagen and up-regulate the production of matrix metalloproteases which further breakdown collagen and elastin.[3] Traditional treatment methods have involved resurfacing techniques, whereby the epidermis is removed and a controlled wound is created that heals with the production of healthier collagen and dermal matrix tissue. These treatments, whilst effective, typically involve a period of post-operative care or downtime and carry risks such as infection, scarring and hyper or hypopigmentation. LED therapies have the advantage of being non-invasive treatments for photo-ageing with little or no risk or downtime involved.

Photo rejuvenation

The effect of LED light on increasing the production of pro collagen, as well as fibroblast proliferation were noted in 1987 in studies by Abergel et al.[4] Several other studies investigating LED therapy for photo-ageing have reviewed yellow light (595nm), red light (633nm) and near infra-red light (830nm). Lee et al. showed a greatest reduction in wrinkle severity and skin elasticity in a group treated with combination 830nm with 633nm. The histological and electron-microscopic findings confirmed increases in collagen and elastin with an increase in pro-inflammatory cytokines.[3] The evidence currently suggests that both 633nm light and 830nm light initiates a regenerative effect by activating macrophages and increasing pro-inflammatory cytokines which in turn promote growth factor release and fibroblast proliferation. This probably occurs by the activation of cytochrome c oxidase in the respiratory chain of mitochondria.[5] The 633nm wavelength has the additional effect of being bactericidal and anti-inflammatory.[6]

Spot prone skin

LED phototherapy has also been shown to be an effective tool in the management of spot prone skin, with blue light having a bactericidal effect initiating free radical release from protoporphyrin and coproporphyrin, found in proprionibacterium acnes, the bacteria responsible for the pathogenesis of acne. When used in combination with red light a deeper penetration is achieved and the red light activates a further form of porphyin, protoporphyrin IX, as well has having a significant anti-inflammatory effect.[6]

Dermalux LED phototherapy

The Dermalux® Tri-Wave device uses a combination of three wavelengths, blue (415nm) red (633nm) and near-infrared (830nm) which can be used concurrently or in any combination with adjustable treatment times. The combination of three wavelengths allows treatment at multiple depths simultaneously, with multiple modes of action. As previous studies have shown, a combination of all three wavelengths is an effective tool in the management of acne, and the use of red and near-infrared is an effective and safe treatment for aesthetic rejuvenation of all skin. I have had excellent outcomes in over 1,500 treatments used as a standalone rejuvenation treatment or when in combination with chemical peels, radiofrequency or fractional ablative resurfacing. My preference is to use three wavelengths for 20 minutes immediately after any skin rejuvenating process, including anything from exfoliating peels to deep laser resurfacing, and then a further 5 sessions every 48 to 72 hrs. As a standalone skin rejuvenation process in healthy skin I try to combine treatments on a weekly basis with an evidence-based skincare regime. The Dermalux LED is such a useful addition to any skincare program I offer in my clinic, it is probably the best investment in technology I have ever made.

Dr Simon Ravichandran is the clinical director of Clinetix Rejuvenation and the president of the Association of Scottish Aesthetic Practitioners.

REFERENCES

1. Goldberg DJ, Amin S, Russell BA, *et al. J Drugs Der- matol* 2006 ; 5 : 748 – 53 .
2. Barolet, D. Semin Cutan *Med Surg* 2008 ; 27 : 227 – 38 .
3. Lee SY, Park KH, Choi JW, *et al. J Photochem Photobiol* 2007; 88 : 51 – 67.
4. Abergel RP, Lyons RF, Castel JC, Dwyer RM, Uitto J. *J Dermatol Surg Oncol*. 1987 Feb;13(2):127-33.
5. Wong-Riley MT, Liang HL, Eells JT, *et al. J Biol Chem*. 2005;280:4761-4771.
6. Goldberg DJ. *J Cosmet Laser Ther* 2006 ; 8:71 – 5.