

# New Uses Emerge for Light-Emitting Diode Technology

By Kevin A. Wilson, Contributing Editor

Scientists at the 14th EADV Congress in London (October 13-16, 2005) announced ground breaking applications of light-emitting diode (LED) technology. In a symposium entitled, "Advances in LED Technology," presenters discussed the role of LEDs in pain management, skin rejuvenation, wound healing, cosmesis, acne treatment, and enhancing the benefits of poly-L-lactic acid (Sculptra, Dermik Laboratories, Berwyn, Pa.), Aptos threads, and botulinum toxin.

**"Initial clinical results** suggest that the Omnilux LED system from PhotoTherapeutics, Inc. (Lake Forest, Calif., and Manchester, U.K.) will have a pivotal role in pain management," according to R. Glen Calderhead, M.Sc., Ph.D., F.R.S.M. "Studies show that the pain transmission process can be attenuated by phototherapy," said Dr. Calderhead. "The 830 nm light activates production of endorphins and blocks pain transmitting chemicals, causing non-narcotic analgesia. Recent studies have proven the efficacy of this wavelength in the management of sports and muscle injuries." Dr. Calderhead is president of LG Biomedical, Japan, and research coordinator at the Japan Phototherapy Laboratory.

The advantages of LED technology are both technical and financial. "A major advantage is that it's quasi-monochromatic," Dr. Calderhead said. "Other systems deliver wider spectra, and their lack of wavelength specificity is not as effective as narrowband

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light sources. There is no point in choosing extraneous wavelengths that are not absorbed by target cells. Another advantage is the LEDs extremely low cost. Intense pulsed light systems and non-ablative lasers are expensive for skin rejuvenation. Laser diodes are not costly, but you get approximately 200 good LEDs for the cost of a single laser diode, and you can cover more area with a single treatment."

**"The scientific literature** demonstrates that infrared light penetrates tissue more effectively than visible light," Dr. Calderhead added. "Intensity is also



Nick Lowe, M.D., F.R.C.P., F.A.A.C.S.

important, and LEDs are ideal in this regard. LED therapy is effective, non-invasive, painless, free of side effects, easy to apply, and well tolerated by all ages and all types of patients," Dr. Calderhead said. "I think that LED therapy is the medicine of the new millennium."

"Used in combination with 5-aminolevulinic acid (ALA) photodynamic therapy (PDT), the 633 nm light of the Omnilux has reduced fine lines and wrinkles and softened skin with only mild phototoxicity," according to Nicholas J. Lowe, M.D., F.R.C.P., F.A.A.C.S. Dr. Lowe, a consulting dermatologist at the Cranley Clinic in London and practitioner in Santa Monica, Calif., noted these results four weeks after a single treatment.

**"Over the years** of using ALA/PDT for treating cancers and precancers, we've noticed a skin rejuvenation component to the therapy," Dr. Lowe reported. "In a pilot study of photorejuvenation, we applied ALA (5%) to the periorbital area for 30 minutes, and then used the Omnilux at 633 nm, 96 J/cm<sup>2</sup>, and 105 mW/cm<sup>2</sup> for 20 minutes. One treatment showed softening of periorbital lines still after four weeks. Side effects included mild erythema and skin peeling, but these were easily tolerated by patients," he added.

"One of the great things about this LED unit is its versatility," said Dr. Lowe. "You can treat different parts of the body, such as the chest and décolleté area, which are extremely important in women."

**"LED treatments accelerate** wound healing, improve skin texture, and give an excellent cosmetic result," reported Mario A. Trelles, M.D., Ph.D. "LED



Mario Trelles, M.D., Ph.D.

technology is effective, economical to implement, and a useful adjunct to cosmetic procedures,” said Dr. Trelles, a plastic surgeon at the Instituto Médico Vilafortuny/ Fundación Antoni de Gimbernat, Cambrils, Spain.

According to Dr. Trelles, the efficacy of LED technology is based on how different wavelengths affect the action potentials of cells involved in wound healing. “Light at 630 to 670 nm and 830 nm stimulate action potentials, whereas 904 nm light retards action potentials of most wound healing cells,” said Dr. Trelles. He added that “a study using a 632.8 nm laser to accelerate burn healing in hairless mice showed promise, as did later work done on humans,

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but results were not easy to reproduce. With the 630 nm and 833 nm LED, results were more consistent and repeatable. Inflammatory signs were decreased, recovery rate was increased, and cosmetic results were enhanced.”

**Encouraged with these** results, Dr. Trelles combined LED phototherapy with incisional surgery and found that healing time, bruising, and pain were reduced

while skin color, texture, and overall quality improved. Dr. Trelles has created an LED treatment protocol of five, twice weekly, 20 minute treatments, two with 830 nm light followed by three with 633 nm light.

Alternating red (633 nm) and blue LED light (415 nm) in a series of eight sessions shows promising results in the treatment of mild to severe acne, according to Tony Chu, M.D., consultant dermatologist, substituting presenter for Bruce Russell, M.D.

**“Dr. Russell showed** that LED red-blue therapy gave significantly better results than blue light, oral antibiotics, and topical therapy,” Dr. Chu said. “Results with the LED included 81% reduction in lesion count at 12 weeks and marked reduction in pore size, with no damage to the sebaceous gland.” Dr. Chu is head of dermatology at Hammersmith Hospital in London.

According to Dr. Chu, *Propionibacterium acnes* absorbs blue light, which reacts with intracellular coproporphyrin III to produce singlet oxygen which destroys only bacteria and not the surrounding tissue. “The rationale behind using red and blue light is that red light has been used for many years to accelerate healing in chronic leg ulcers and non-healing lesions,” Dr. Chu said. “It is thought to have an anti-inflammatory effect and to work via cytokine induction.” How red and blue light is used alternately reduces sebum excretion and post treatment flare-up needs to be further investigated, he added.

**The Omnilux reduces** swelling and bruising in patients given botulinum toxin, Sculptra, or Aptos threads, according to Fabian Baez, M.D.

“I use different treatment modalities to produce good clinical results that are inexpensive,” said Dr. Baez, who practices at the International Centre for Cosmetic Medicine in Australia. “Over the past few years I’ve incorporated the Omnilux into almost every part of my daily routine.”

**Dr. Baez treated one** group of patients with Sculptra and another group with Sculptra plus the Omnilux. Patients in both groups completed a short questionnaire to assess satisfaction, recovery time, side effects, and results. Patients in the Sculptra-Omnilux group reported less swelling, bruising, and recovery time than patients treated only with Sculptra. Dr. Baez found comparable results in patients treated with Aptos threads or botulinum toxin combined with Omnilux treatment.

To find out more about Omnilux technology visit [www.omnilux.co.uk](http://www.omnilux.co.uk). ■