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Skin DEEP

INTRODUCING

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HEALING With LIGHT

All about LED therapy

By Michele Phelan

Light-emitting diode (LED) modalities are increasingly popular in skin care clinics as well as physicians' offices. The multiple healing uses of this therapy enable practitioners to bring tremendous benefits to the skin without the need of an invasive or uncomfortable machine.

LED therapy has very few contraindications and can be used safely on most clients, either alone or as an adjunct to other treatments—for example, to help calm the skin after extractions, or during a microcurrent treatment to aid in cell regeneration. In the medical world, “LEDs can be used before laser, dermabrasion, and cosmetic surgery procedures to help prepare the skin for the healing process,” says Bradley Greene, MD, FACS, a board-certified facial plastic and reconstructive surgeon located in Portola Valley, California. “They can also activate fibroblasts to help generate collagen remodeling.”

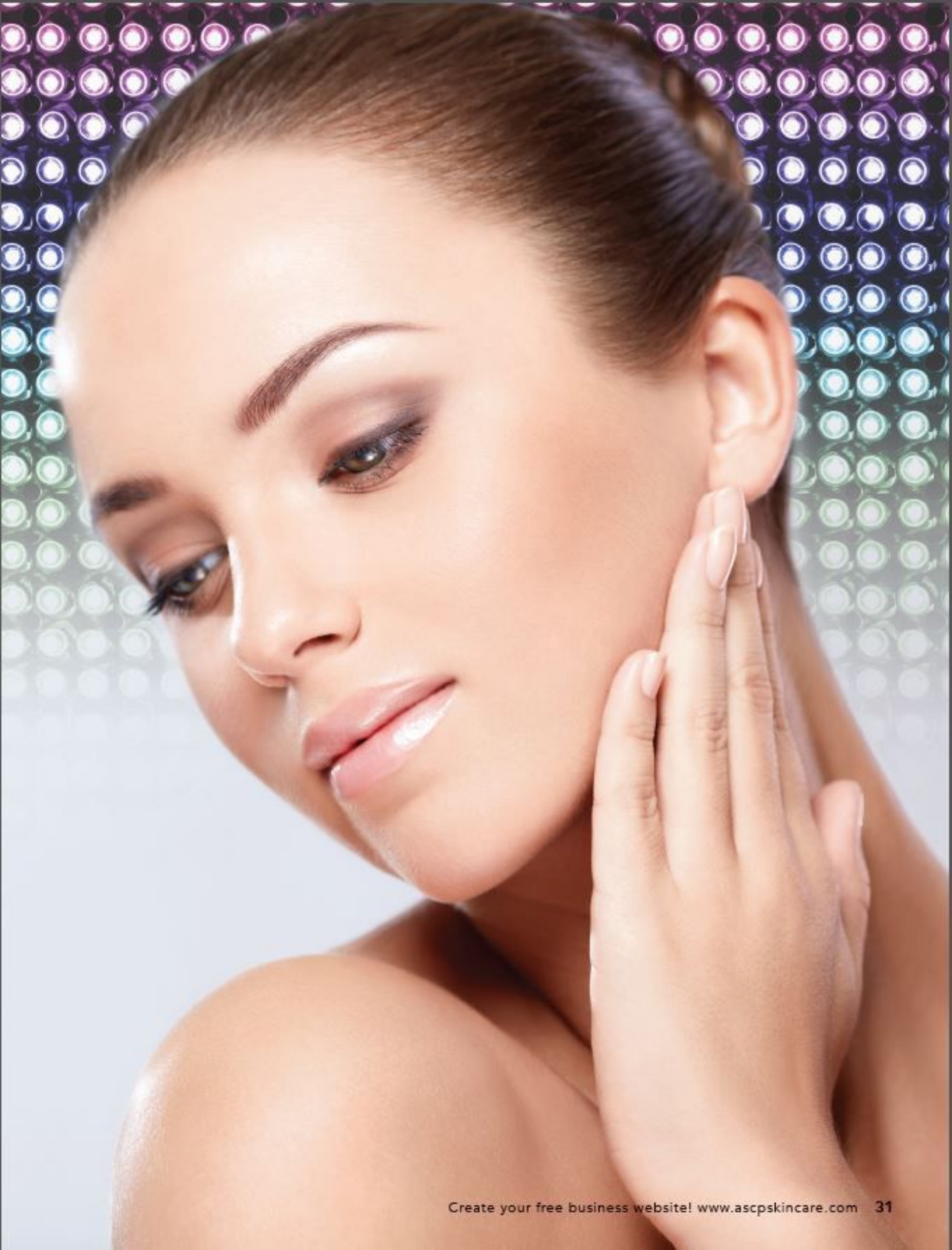
So, what are LEDs anyway and how can simple light waves be so healing to the skin?

How LEDs Work

A diode is any type of electrical component that allows electricity to pass through it in only one direction; a light-emitting diode is a semiconductor in which a one-way current releases energy in the form of photons (light particles). The color of the light does not come from the bulb or plastic casing of the LED, but is created by the diode itself.

In simplified terms, an LED converts electric energy into light energy. This is not new technology. LEDs were first developed in 1927 and have been used in electronics since the 1960s, though their potential uses in healing have only been explored within the last 20 years.





In the late 1980s, during a series of studies by NASA on how to grow plants in space, researchers unexpectedly discovered that the red LED lights they were using on the plants also prompted cell regeneration. NASA's research spawned a broad investigation into the healing effects of LEDs by other researchers and led to new uses for this technology in health and beauty.

A Quick Guide to Light

All light is radiation. The light that is visible to the human eye is only a very small percentage of the entire electromagnetic radiation spectrum that is emitted by the sun, which includes radio waves, microwaves, infrared waves, visible light (which is further divided into red, orange, yellow, green, blue, indigo, and violet wavelengths), ultraviolet waves, X-rays, and gamma rays. The longer the wavelength, the lower the frequency, and the more penetrability the radiation will have through human tissue.

The range of wavelengths that humans are able to see is very narrow, between approximately 400–700 nanometers. The term *nanometer* is often related to the length and strength of the wave and correlates with a specific color. For instance, wavelengths of approximately 650 nanometers are visible to us as red light.

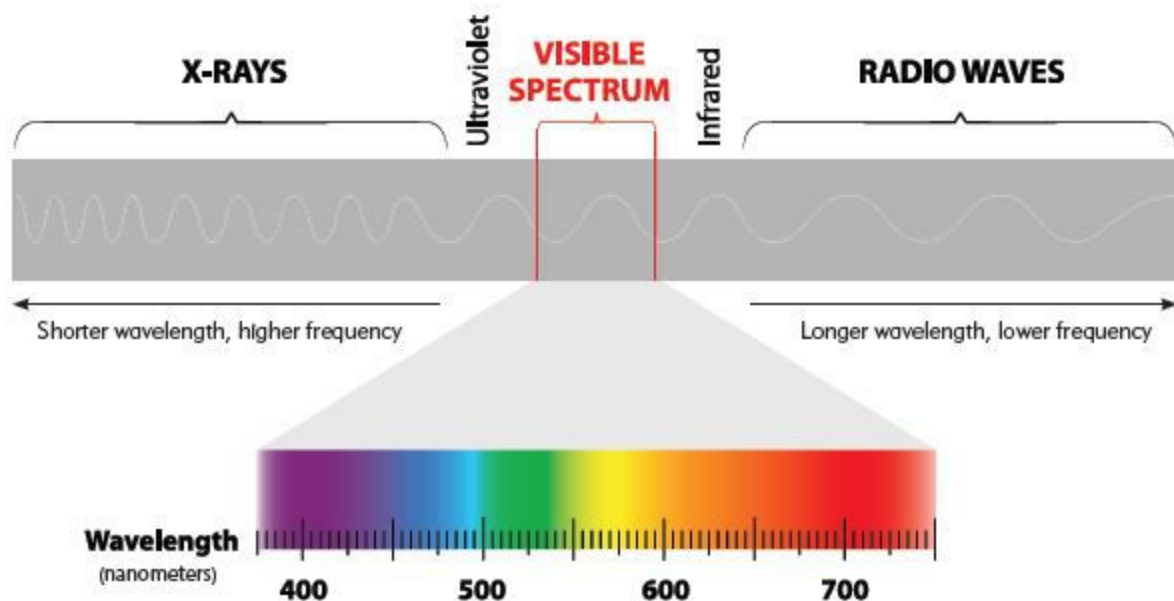
White light is a combination of all the colors. When white light passes through a prism it is split into individual colors—the colors of the rainbow.

Ultraviolet rays (which are further divided into UV-A, UV-B, and UV-C wavelengths) range from about 200–400 nanometers, so they are not visible to us. A certain amount of UV radiation is essential to almost all life forms on Earth, but excessive exposure can be damaging—we are all familiar with its negative effects on the skin. At the other end of the spectrum, infrared waves range from 700 to over 1,000 nanometers, meaning they are longer waves with a lower frequency and can penetrate more deeply into the skin. Infrared waves are invisible, too, but we perceive them as heat. The warmth you feel from the sun mainly comes from infrared waves.

Lasers, LEDs, and Intense Pulsed Light

Laser treatments and intense pulsed light (IPL) treatments use the same wavelengths of light as LEDs, but the three are very different. The most important difference is whether that light is coherent (focused) or noncoherent (scattered).

Lasers create coherent waves of light—this means the light forms a narrow beam. They can be very hot, and some are ablative (able to cut or vaporize tissue). LEDs create noncoherent light, like an ordinary light bulb. They are non-ablative and cool. IPL treatments also use noncoherent light and are non-ablative, but they generate heat.



In much the same way that plants use chlorophyll to convert sunlight into tissue, light at the appropriate wavelength and dose can trigger a natural cellular reaction.

There is also a big difference in the amount of energy they put out. LEDs produce just a fraction of the energy produced by IPL and lasers.

LED devices may have settings for continuous or pulsed output, but a pulsed LED is still an LED. This is not the same as IPL.

How Can Light Heal Skin?

In much the same way that plants use chlorophyll to convert sunlight into tissue, light at the appropriate wavelength and dose can trigger a natural cellular reaction in animals.

The part of a molecule that absorbs color (in other words, light) is called a chromophore. When light is absorbed by chromophores, it is taken into the mitochondria of the cell to initiate a photochemical effect, and subsequently a biological effect in the tissue. For instance, when red light is applied to the skin, the effect it creates after being absorbed into the cells is to convert glucose to adenosine triphosphate (ATP). This, in turn, allows the cell to replicate more efficiently and start to participate in the healing process of the skin.

Cells that are not functioning optimally stand to benefit the most from LED treatments. The outcome of this is increased cellular energy and better circulation, leading to greater tone, texture, color, and overall health and vitality of the skin.

A certain amount of light must be absorbed by the tissue being treated in order to activate a cell response. It is still debatable what the best protocol is for any specific treatment. Many manufacturers of LED equipment have their own individual treatment protocols based on studies performed with their equipment—this is helpful, because LED equipment with a lower energy output may require more exposure time to obtain the desired effect, and vice versa. Some LED devices include a positioning system to help provide optimum cell response. But all protocols must take into consideration the treatment objective when deciding on a suitable time frame, number of sessions, wavelength, joule (energy) output, and whether continuous or pulsed light should be used.

Different Colors, Different Uses

As mentioned, the wavelength of radiation determines how far into the skin or body it can penetrate. Different colors are similar enough in wavelength that the benefits overlap to some extent, so research into the best treatment protocols continues to develop. However, here is the general consensus on the benefits of each color:

Red LED

- Antiaging and regenerative effects, partially by activating fibroblasts.
- Increases the rate of healing.
- Increases circulation.
- Decreases hyperpigmentation.

Yellow/Amber LED

- Stimulates immune system.
- Increases the rate of healing.
- Decreases lymphedema.

Green LED

- Decreases erythema/couperose.
- Decreases hyperpigmentation.
- Decreases inflammation.
- Increases the rate of healing.

Blue LED

- Penetrates the epidermis and dermis.
- Kills acne bacteria. Acne bacteria create small molecules called porphyrins, which produce oxygen molecules when exposed to blue light. This destroys the acne bacteria (propioni), which are anaerobic and do not survive well in the presence of oxygen.
- Decreases edema, erythema, and inflammation.
- Increases the rate of healing.
- Increases cellular regeneration.
- Increases circulation.
- Stimulates the lymphocytes (white blood cells).



Infrared LED

In skin care, we use near-infrared waves to heat the skin to make it more permeable to skin care products, relax tight muscles prior to massage, and increase circulation. Some treatment protocols use this wavelength to help tighten and tone the skin. This all depends on the strength of the modality and the application being used.

Since infrared is not visible light, many manufacturers sell their infrared lamps with a red bulb or cover so the operator can see the light and know where to place it over the skin. This is also for safety purposes, to make sure the lamp is not placed too closely to the skin where burning might occur.

Contraindications

LED therapy is extremely safe for most people, but there are a few provisos.

A history of epilepsy or migraines is a contraindication. Looking at the light can trigger a reaction in some people with these conditions—especially if it's a pulsing light.

LED therapy should also be avoided by clients with photosensitive skin, or those taking medication that can cause photosensitivity (for example, retinoids and tetracycline antibiotics).

Clients with very sensitive eyes can be treated if you take extra precautions to cover the eye area completely.

Appropriate eye protection should be worn by any client, and sensitive clients should use goggles, not just eye pads.

Pregnant women can safely receive facial LED treatments, but the light should not be applied directly over the abdomen.

Safe, Effective, and Healing

Prior to using LED equipment it is advantageous to acquire as much training as possible about this unique technology. When purchasing the equipment, make sure it is from a reputable, respected manufacturer. A manufacturer or supplier who is willing and able to answer your technical questions about this modality and provide training on their particular piece of equipment is a company worth investing in. With effective training, you can ensure your clients will receive the best possible results from all their treatments. §



Michele Phelan, LE, RA, CIDESCO diplomat, has been a licensed esthetician for more than 27 years, including 20 years as a spa owner. She has taught esthetics at every level, has served as a CIDESCO examiner, has contributed articles to many industry publications, and is the executive director of Concepts Institute of Advanced Esthetics, where she also teaches clinical esthetics. Visit www.conceptsinstitute.com or contact her at conceptsmmp@yahoo.com.

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