LED LIGHT THERAPY

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Three medical doctors comment on light as therapy:

"...I can safely say that in the more than 30 years I've been a medical-care provider, no technology has had a more profound effect on my practice—and on the lives of my patients."[1]

- Dr. Len Saputo, MD

"The use of light as a natural form of energy from nature actually activates the normal biochemistry of the cell so that the cell tends to take from it what it needs..."[2]

- Dr. Harry Whelan, MD

"We are human photocells whose ultimate biological nutrient is light. … This light is then released into our systems as electrical energy."[3]

- Dr. Gabriel Cousens, MD

Sunlight nourishes our planet allowing all life—plant, insect, bird, animal and human—to flourish. Our solar system and our Earth nourish us with the vibrations of light from the invisible to the visible, encompassing colors that range from the violets to the reds. Our bodies depend on all these colors for health.

Sunlight nourishes plant life by triggering photosynthesis. This process allows plants to take in carbon dioxide from the air along with water and nutrients from the soil. Light is the spark that then transforms these nutrients to nourish all life in the form of chlorophyll, minerals, vitamins and other nutrients. Of course, the myriad of nutrients our plants supply have special healing qualities as well—herbs have a long tradition of use as medicines.

The importance of light to body processes and our health has recently been captured by scientists in the US. They developed a new technique to study what activates the vibrations of nutrients so they can carry out their work within the cell. The scientists discovered the vibration or activity of a protein depends on that protein absorbing light. They revealed that the symphony of life depends on light.[4]

Light is crucial nourishment for our body cells. We absorb light through our eyes and our skin—especially at acupuncture points. Light is a stimulus that charges the mitochondria, the battery for each cell. This creates the natural flow of electricity and energy within the body. Our electrical system, in turn, triggers the chemical reactions—the hormones, vitamins, minerals, enzymes—for our bodies to function.

LED Light for Health

As the 21st Century approached, a series of NASA press releases reported on Dr. Harry Whelan's research with the latest light technology—LED lights. The research sponsored by NASA, at the Medical College of Wisconsin, focused on the benefits of using light emitting diodes (LEDs) for health.

The research indicated faster healing of severe burns, difficult-to-heal wounds, muscle and tendon sprains, damaged nerves and eye injuries. A press release dated December 2000 announced: "Using powerful light-emitting diodes, or LEDs, originally

designed for commercial plant growth research in space, scientists have found a way to help patients here on Earth."[5]

Laser Therapy Paved the way for LED Light

Low level laser light was the forerunner to the advent of LED (light emitting diodes) light. The use of laser light revolutionized areas of medical surgery. For example, surgeons use high power laser light to repair torn retinas and for other delicate eye surgeries. The type of laser light used for surgery differs from that used for therapeutic purposes. The use of therapeutic lasers is referred to as low level laser therapy (LLLT). Therapeutic laser light is used to speed healing in the field of dentistry, for wound healing, for skin conditions and other applications. An extensive body of research using laser therapy has given direction to LED research.

Professor Endre Mester

In 1965, shortly after the first working lasers had been developed, Professor Endre Mester of Semmelweis University in Budapest, Hungary launched pioneering research using laser light. For his first project he wanted to know if lasers might cause cancer. He shaved the hair off the backs of mice—both the group to be treated and the control group. The treated group did not develop cancer but to his surprise the hair on their backs grew more quickly. Research on the healing effects of low level laser therapy was launched!

In 1971, Professor Mester's first paper was published reporting that laser light was effective for healing wounds. It became a family affair when two sons joined him in his research. By 1984, more than 1,300 patients—with wounds or ulcers that wouldn't heal using conventional medicine and plastic surgery—had been healed using low level laser therapy.[6,7]

Meanwhile, the former USSR was also making progress with low level laser therapy research. During their war with Afghanistan in the 1980s, Soviet soldiers benefited from the use of low level laser therapy to speed wound healing.

This research provided a springboard for LED research. A NASA press release in the US heralded the news: "The near-infrared light emitted by these LEDs seems to be perfect for increasing energy inside cells. This means whether you're on Earth in a hospital, working in a submarine under the sea or on your way to Mars inside a spaceship, the LEDs boost energy to the cells and accelerate healing."[5]

Professor Tiina Karu

A researcher based in Russia, Professor Tiina Karu, is considered a world-leader in both low level laser and LED research. Karu states that LED light is "… now used widely and successfully in clinical practice." She also states that LEDs are equivalent to low level lasers except possibly in "deeper tissue layers."[8]

Dr. Harry Whelan, head of the NASA-sponsored research, stated: "NASA developed LEDs to offer an effective alternative to lasers."[9]

The use of laser devices is more in the realm of health professionals as it takes training to be used safely. In contrast, LED light technology can readily be used for personal use in the home and has the advantage of being able to treat a larger area. Since the 1990s, the use of LED technology in research, in clinical practice, and by consumers has established both the safety and effectiveness of LED light.

LED Light and Color

LED light therapy units will often describe the color in terms of the wavelength of the LEDs. The wavelength is measured in nanometers (nm). The human eye sees wavelengths as colors.

The following chart shows the range of wavelengths (colors) in the visible light spectrum. Visible light ranges from the violets at about 380 nanometers to the deepest reds at about 750 nanometers.

There is also light that is invisible. On the violet end of the spectrum, we have ultraviolet light—less than 380 nanometers. At the red end of the spectrum, we have infrared light—greater than 750 nanometers. In both cases these wavelengths are outside the range of human sight and therefore they are invisible to us.
LEDs, to date, are not being designed for their healing benefits. They are used in the industrial manufacturing industry and have been built for this sector. Researchers have used currently available LEDs for their medical studies. Research protocols must be precise so the reports describe the LEDs in terms of their nanometers. As an example, researchers cannot simply say their research used red LEDs—the LEDs must be described using their exact wavelength in nanometers. For example, 635 nm LEDs, in the red spectrum, are very common and have been used in medical research. When 670 nm LEDs became available, also in the red spectrum, research was done with this wavelength. Both indicated effectiveness for healing.
Unfortunately, some manufacturers use nanometers—a measurement used in research—as a marketing tool to explain why their particular unit is superior. In addition to 635 nm and 670 nm, LED light therapy research has shown that several wavelengths of red, as well as other colors, are effective for healing.[10] When a particular nanometer is used in research it does not mean it is the only nanometer to have healing benefits.
Keep in mind, we are not aware of any scientific studies that show any one wavelength or color is not effective. The long history of using color for healing tells us that there are therapeutic benefits to all wavelengths of light. In other words, all colors or nanometers have healing benefits. Eventually, scientific research will experiment with more and more wavelengths of color, to catch up with the knowledge amassed through traditional color therapy.

Research on LED Light for Healing

Research using LED light, mostly in the red and near infrared ranges, shows healing effects for severe burns, wounds, hard-to-heal diabetic skin ulcers, and eye injuries. Studies indicate LEDs also relieve pain and are being used to rejuvenate skin and reduce wrinkles.

Wound Healing

Dr. Harry Whelan, as head of the team for the NASA-sponsored LED studies at the Medical College of Wisconsin in Milwaukee in the US, used both Near-Infrared (NIR) and Red LEDs. Whelan and his team report "… this special lighting technology helps hard-to-heal wounds, such as diabetic skin ulcers, serious burns, and severe oral sores caused by chemotherapy and radiation."
NASA reported the healing of "severe oral sores caused by chemotherapy and radiation" in a study with children: "A nurse practitioner places the box of LEDs on the outside of the patient's cheek about one minute each day. The red light penetrates to the inside of the mouth, where it seems to promote wound healing and prevent further sores in the patient's mouth."

One of the oncologists supervising the study said, "Some children who probably would have had to be fed intravenously because of the severe sores in their mouths have been able to eat solid food."[11]

Several studies are proving LED light therapy to have powerful healing effects for healing wounds.[12,13] A laboratory study on wound healing carried out at the University of Ghent in Belgium, exposed cells to three colors—NIR, red and green—using either low level lasers or LEDs. While all three colors were effective to boost the cells ability to heal, they found green increased wound healing the most.[14]

NASA also funded lab research that provides evidence for the amazing ability of LED light therapy to heal. When exposed to NIR LED light, skin and muscle cultures, grew 150 to 200 percent faster than the cultures that were not stimulated by the light. The growth of the cells explains why LEDs speed the healing of wounds and sores.

A study applying LEDs to Navy personnel who experienced muscle and joint injuries during training confirmed the good news. The doctors reported healing improved by 40 percent when LED light was applied.[5]

Dr. Harry Whelan

Reversing Blindness and Promise for Eye Injuries

Research by Dr. Whelan's team indicates the amazing potential for LED light therapy to alleviate suffering for both humans and animals with difficult-to-treat eye problems. After injecting methanol (known to cause blindness) in rats, only three brief treatments were sufficient to reverse the damage. The research also highlights the potential for LED treatment to stimulate the repair of nerves that are known to be notoriously hard to heal.

Here's a description of the research and why the LEDs were effective:

… Whelan blinded rats by giving them high doses of methanol, or wood alcohol. This is converted by the body into formic acid, a toxic chemical that inhibits the activity of mitochondria. Within hours, the rats' energy-hungry retinal cells and optic nerves began to die, and the animals went completely blind within one to two days.

But if the rats were treated with LED light with a wavelength of 670 nanometers for 105 seconds at 5, 25, and 50 hours after being dosed with methanol, they recovered 95 per cent of their sight. Remarkably, the retinas of these rats looked indistinguishable from those of normal rats. "There was some tissue regeneration, and neurons, axons and dendrites may also be reconnecting," says Whelan.

These findings have profound implications in the use of LED light treatment, called photobiomodulation, for a non-invasive way to treat retinal diseases and injury and prevent blindness.[15]

Dr. Harry Whelan summed it up:

The results of this study and others suggest that photobiomodulation with red to near-IR light augments recovery pathways promoting neuronal viability and restoring neuronal function after injury. Importantly, there was no evidence of damage to the normal retina after 670-nm LED treatment. Based on these findings, we suggest that photobiomodulation may represent an innovative and novel therapeutic approach for the treatment of retinal injury and the treatment of retinal diseases, including age-related macular degeneration, glaucoma, diabetic retinopathy, and Leber's hereditary optic neuropathy.[15]

(Please note we do not support research on animals unless the animals are already suffering and they can be helped with the application of a therapy.)

The short treatment times reported in the NASA-funded medical research brings up the subject of the intensity of the light.

LED Light and Intensity

Some companies claim that the intensity of their light output is more powerful and so is superior to a unit with a lower intensity light output. Intensity of light is an indicator of the dosage of light received per treatment. A lower intensity unit would need to be applied longer than a higher intensity unit to receive the same dosage of light.
Typically, the higher intensity units are used for medical research and applications. Higher intensity LEDs generate more heat so they can easily cause burns. Higher intensity devices, therefore, have to be made with safeguards in place to avoid over-heating. Lower intensity units are better suited for personal and home use as they are safer and can readily be used without medical supervision.

More Healing Benefits of Light Therapy

We've selected a medical doctor's personal experiences and case reports to further highlight the healing effects of LED light therapy.

Rapid Healing of a Second-Degree Burn

While barbecuing, Dr. Sherry Rogers, a medical doctor specializing in natural therapies and environmental medicine, suffered a painful burn to her hand. She grabbed a frying pan handle that had been inside a 450-degree grill for 25 minutes. Ouch! Fortunately, she had an LED unit handy so she alternated applying the LED unit with ice. She reports: "In 35 years of medicine I've never seen 2nd degree burns revert to normal in 4 hours."[16]

Healing of a Non-Healing Diabetic Skin Ulcer

The following case report describes how a 75-year old man finally found relief from long-standing sores. Diabetic skin ulcers are known to be notoriously difficult to heal. Red LED light was applied only every other day for 16 minutes at a time.
The researcher reported: "Rapid and excellent wound healing was seen. Wound healed totally in 15 phototherapy sessions spread over 5 weeks. New epithelium was thin having good texture and without fibrosis. … 660 nm Red Light Phototherapy was found to be very effective for healing of the Non-healing Diabetic Ulcer where routine treatment had failed."[17]

Easing Arthritic Pain and Increasing Mobility

One study describes how LED therapy reduced pain and increased mobility for those suffering from degenerative osteoarthritis. Patients applied LED light, either Red or Near Infrared, themselves to both sides of the knee for 15 minutes twice a day for 10 days. Those who used Red LEDs went an average of four months before requesting further treatment for pain. Those who used Near Infrared LEDs went an average of six months before requesting further treatment for pain. The control group who received a placebo light treatment went only about two weeks before requesting more treatment.[18]

Allergy Relief

Dr. Sherry Rogers shared how she suffers from a debilitating food allergy. When inadvertently exposed to the allergen, Dr. Rogers describes her symptoms saying they "…can leave me incapacitated with unbearable back pain that mimics a ruptured

disc, complete with paralyzed leg …" She applied an LED unit: "I've never seen anything else that could make such a dramatic difference and allow me to skip 2½ weeks of incapacitating agony. God clearly uses my body to teach me."[16]

Rejuvenating Skin

Our skin is flexible or elastic. The expansive and contractive quality of our skin is a result of connective tissue. Our connective tissue contains a protein called collagen that provides structure for our skin. As we age, the production of collagen decreases and our skin loses elasticity and wrinkles form. Cells called fibroblasts are needed to create the collagen that keeps skin resilient and healthy. Research indicates that fibroblast cells are increased when using LED light—resulting in collagen formation to repair skin and reduce wrinkles.[19,20]

How Deeply Does Light Penetrate the Body?

The penetration of light into the human body varies. Light at the Red end of the color spectrum penetrates deeper than light at the Blue end of the spectrum. NASA reported on their research using LEDs commenting that, "wavelengths of 630–800 nm [red and NIR] travel approximately 23 cm [approx. 9"] through the skin surface …"[9]

The depth of penetration of LED light does not limit the healing effects. To reach deeper into the body, an understanding of how acupuncture points connect to meridians as discovered in ancient China, is useful.

Dr. Pankratov, a Russian researcher and his team, discovered the meridian system within our bodies conducts light. When applying light to certain areas of the body, his research team found the light traveled: "Suddenly, the experimenters registered a strong light signal—a tiny speck of light at a not illuminated area about 10 centimeters distant from the illuminated surface. One can imagine the surprise of the experimenters when they discovered the spot of light that had spread under the human skin …" Dr. Pankratov reported, "The most amazing fact was that the 'light sensitive regions' coincided with the well known acupuncture points on the body surface, described by ancient Chinese acupuncture experts for thousands of years and named 'meridians'."[21]

Dr. Pankratov concluded: "If for instance, a living organism at a certain spot is exposed to visible light, the light can travel immense distances, determined by the routing of the meridians. … we are dealing with a 'light distribution system', similar to a fiber optics system."[21]

Pulsing LED Light

Pulsing light simply means a frequency has been added to the color. With an added frequency, the LED pulses the color. The added frequency offers additional healing qualities. LED research has only begun to explore the benefit of pulsing or adding frequencies to LED light therapy. It is the experience of veterinarians and acupuncturists that has led the way with pulsing light. Pulsing light, using a series of frequencies that resonate with natural body frequencies, was discovered by Dr. Paul

Nogier. These pulses are known as the Nogier frequencies and have been well documented for their healing benefits. The Nogier frequencies, as well as other pulse rates, when combined with the color of LED light therapy enhance healing effects.

How LED Light Triggers Healing

Light stimulates healing reactions in the body—reactions that continue even after the light is removed. Tiina Karu's research, exploring the specific ways monochromatic or single colors of LED light trigger healing, proved LED light improves metabolism. Metabolism is an all-encompassing term used to describe the chemical and biological processes that sustain life. A high level of metabolism means:
Metabolism is a process crucial to health. The fact that LED therapy improves metabolism helps account for the widespread healing effects. An amazing circle of events starts by simply showering cells with LED light. At least three healing processes are triggered within cells to improve metabolism:

Enzymes

Enzymes are catalysts needed for every chemical reaction. We function at a high level when enzymes are plentiful. Research is proving LED light restores or promotes enzymes to speed the healing process.
Dr. Sherry Rogers sums up the research by explaining the reaction within our cells:
… the LED reversed the damage to the enzyme cytochrome oxidase. This enzyme is actually stimulated by light in the far red visible to near-infrared spectra as it strongly absorbs this stimulating energy. This energy transfusion in turn increases electron transfer in the mitochondria, leading to increased energy synthesis for healing. … Cytochrome oxidase is just one of several enzymes that can be turned on by light.[16]
Mitochondria are an area within cells that use raw materials and convert them to energy. Mitochondria are the powerhouse for each cell.

ATP

The boost in enzymes creates more ATP or Adenosine triphosphate. More ATP means more energy. More energy means easier and faster healing … and being better able to handle life's challenges and enjoy the process.
Dr. Whelan sums up the NASA sponsored research with regards to energy:
So far, what we've seen in patients and what we've seen in laboratory cell cultures, all point to one conclusion, … The near-infrared light emitted by these LEDs seems to be perfect for increasing energy inside cells. … the LEDs boost energy to the cells and accelerate healing.[5]

Dr. Tiina Karu emphasizes the importance of ATP saying "… ATP is not only an energy currency inside cells, but it is also a critical signaling molecule that allows cells and tissues throughout the body to communicate with one another."[22]

DNA

How do cells know what to do? It starts with DNA. Each cell contains DNA—a spiral shaped storehouse for light and sound frequencies—and the blueprint for a cell to replenish or replace itself. DNA is our blueprint for health.
Dr. Whelan explains how light applied in both the red and near infrared ranges worked: "Furthermore, DNA syntheses in fibroblasts and muscle cells has been quintupled using NASA LED light alone …"[23]
This means the forming power of our cells has been increased by five times in muscle cells with the application of three colors of LED light in the red to NIR range.

Summing Up

LED light stimulates a powerful team to harness our cells for health and energy—enzymes, ATP and DNA. It is also important to note that Dr. Karu emphasizes that LED light acts as a trigger to start the healing process. In other words, healing effects continue after the light source has been removed.
LEDs have given us a convenient and easy way to use light therapy for health. LED technology has made it easy to add special healthy frequencies to light therapy. The Nogier frequencies, in particular, are known to boost the healing power of the LED light therapy.
Light therapy is a trigger to help maintain the flow of our natural electrical and chemical systems. LED technology has brought us a wonderful tool for health.

Additional Resources

"Colored Light Therapy: Overview of its History, Theory, Recent Developments and Clinical Applications Combined with Acupuncture," Anna Cocilovo, American Journal of Acupuncture, Vol. 27, No.1/2, 1999. www.acupuncturejournal.com/AJASple3.html
News and Information for Medical Professionals Related to the Use of Light for Diabetes: "Nitric Oxide and Its Role in Health and Diabetes: Part 9. How Light (Photo Energy) May Increase Local NO and Vasodilation," Thomas Burke Ph.D. www.diabetesincontrol.com/burkearchive/nitricoxide9.shtml

References

A complete list of references is available in our Reference section. References >