

HEALING
With

Light

Red and near-infrared light therapy offers vast potential for treating chronic pain, inflammation, brain injuries, and more.

By AMY PATUREL

Nora Miller was an avid, lifelong runner who had completed five marathons when she strained her Achilles tendon during the summer of 2014. Rather than abandon her regimen, Miller, a 42-year-old exercise physiology researcher at the University of Wisconsin–Milwaukee, pushed through the pain, hoping she could tough it out. But that only further

inflamed the tendon, leaving her idle and frustrated with her inability to heal. “I was desperate to get back to running,” Miller says.

She mentioned her plight to Janis Eells, a colleague in UWM’s College of Health Sciences. Eells, a professor of biomedical sciences, suggested that Miller try using a handheld device that would expose her tendon to red light for

90 seconds a day, 3 out of every 4 days. “I was scheduled to have a painful platelet-rich plasma injection in 12 hours, and I canceled it,” she says. “The way Janis described the research and how enthusiastic she was, I thought, *Why not give it a try?*”

After 2 months of using the device and going to physical therapy, Miller began a walking program

that incorporated some jogging. By October, she’d run her sixth marathon, eventually qualifying for the Boston Marathon. “I don’t have pain,” she says, “and I’m just as active as I was before the injury.”

Eells says that Miller’s experience is consistent with what she and other researchers now know about red and near-infrared (NIR) light therapy, a rapidly emerging

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field with vast healing potential. Studies suggest that NIR light, which is invisible to the human eye, can provide therapeutic relief for people suffering not only from many types of inflammation, as in Miller's case, but also from afflictions as diverse as heart disease, multiple sclerosis, traumatic brain injury, and dementia.

And it does so without the toxicity of more commonly used treatments. "Research suggests light therapy has systemic effects that can dramatically improve quality of life for people suffering from major medical crises," says Margaret Naeser, a research professor of neurology at Boston University School of Medicine who specializes in brain injuries. "And

light therapy is far gentler than other therapies."

Quieting Pain

In ancient times, humans used sunlight for healing, but it wasn't until the 1960s that Hungarian medical researcher Endre Mester first demonstrated artificial light's healing power in a lab. Mester showed that when low-level lasers, a form of red light, were trained on skin incisions in animals implanted with tumor cells, the incisions healed more quickly.

Spurred on by these early findings, researchers began experimenting with varying wavelengths of light to see if they might improve health in other ways. For several decades, doctors have been

using light (particularly blue and forms of ultraviolet) to alleviate skin conditions such as acne, eczema, and psoriasis, among other uses (see sidebar below). Light waves on the red and near-infrared end of the spectrum go further by penetrating beneath the skin to help stanch painful inflammation.

Treating inflammation with NIR light has been a major research focus of Eells and her team. One of their studies included a group of military veterans with spinal cord injuries who were afflicted with stubborn bedsores. In illness or injury, white blood cells gather at the site of damage, creating inflammation. "Chronic wounds are 'stuck' in the inflammatory phase of healing," Eells says. She wondered: What if light could reset the defenses of the veterans' bodies to reduce the inflamed sores?

For the study, the researchers kept the wounds clean and free of infection for 4 weeks. Some patients' wounds were treated with red light phototherapy three times a week for 90 seconds over a period of 4 weeks. Afterward, the researchers compared the rate of wound healing with and without light therapy and found that the wounds treated with red light healed 2.5 times faster than those that weren't treated with light.

The researchers concluded that when injury or illness triggers the immune response, red and NIR light therapy resets the mitochondria so they can function normally again. It does this by triggering the cells to make anti-inflammatory proteins that will speed healing, while turning on antioxidant and energy-boosting genes.

"Light therapy is really about channeling a wavelength of light

ENLIGHTENED TREATMENTS

Eight wavelengths of light used in alleviating health conditions, in the order they appear on the spectrum:

The Carex Daylight Classic Plus light box (\$210) may relieve seasonal depression.



ULTRAVIOLET A

- Studies show UVA to be the most effective light treatment for severe eczema.



NARROW BAND ULTRAVIOLET B

- UVB may help treat psoriasis, vitiligo, and other inflammatory skin conditions.



FULL SPECTRUM

- Full-spectrum light boxes (minus the UV rays) may help alleviate seasonal affective disorder.



BLUE LIGHT

- Studies show it can effectively kill the antibiotic-resistant form of *Staphylococcus aureus*.



BLUE LIGHT PHOTODYNAMIC

- This treats actinic keratoses, skin patches that may become cancerous.



YELLOW LIGHT

- It cuts down on skin redness and possibly helps with rosacea.



RED LIGHT

- Red light is FDA approved for treating chronic pain and may help with wound healing.



NEAR-INFRARED LIGHT

- Studies show that it penetrates the skin to help with brain injuries, chronic inflammation, dementia, and more.



Battling Cancer & Superbugs

Red and near-infrared light aren't the only types drumming up excitement in medical-research circles. Blue light is another potential source of powerful benefits because of its ability to kill both superbugs and cancer cells.

Scientists have found evidence in recent years to suggest that blue light can obliterate infections, including the antibiotic-resistant form of bacteria *Staphylococcus aureus*. Though more research is needed, one 2009 study in *Photomedicine and Laser Surgery* showed that a single dose of blue light killed

up to 92% of two pervasive strains of MRSA.

Jeri-Anne Lyons, a professor of biomedical sciences at the University of Wisconsin-Milwaukee, reported that the blue light appears to work by weakening molecules within the body that are causing the infection. Another researcher, Chukuka S. Enwemeka, former dean of UWM's College of Health Sciences, is seeking to improve on earlier successes by wiping out lingering colonies of bacteria that survive the initial blast of blue-light irradiation. The UWM researchers are working

toward gaining FDA approval for treating infections this way.

Blue light may also be a valuable tool in the battle against cancer. Research shows that exposure to the light can spike levels of nitric oxide, which not only helps relax the vascular system to bring much-needed oxygen to deprived organs and tissues but can also be used to enhance the effects of medication.

It's also a central element of photodynamic therapy, or PDT. Doctors give patients a drug that settles in the cancer cells' mitochondria, where it's

converted into a huge molecule called porphyrin. "The porphyrin is so large that it's really efficient at absorbing light, even just-visible light," says Edward Maytin, a dermatologist at Cleveland Clinic. Once the porphyrin is in place in the cells they want to target, doctors activate it with the blue light to annihilate the cancerous cells. Dermatologists are now using PDT to treat skin cancers.

While still technically a form of radiation therapy, PDT uses harmless wavelengths of light that don't damage the surrounding healthy tissue. The treatment usually takes 15 to 20 minutes under a lamp.

The light also eliminates existing precancers at a rate of 70 to 80% and stalls the progression of lesions doctors can't even see yet, Maytin says.

energy to tissue that can activate the regenerative capacity of the cells through their mitochondria when, for example, a person has tendinitis or a pulled hamstring or is contending with a slow-healing wound," says Fred Grover, an assistant clinical professor of family medicine at the University of Colorado at Denver. Grover uses NIR light-emitting diode (LED) light therapy in his integrative medicine practice.

Lighting Up the Brain

The benefits of NIR may also apply to the brain. Formerly an electrical engineer and clockmaker, 82-year-old Rudy Trouwborst, of Ottawa, began fumbling words, reverting to his native Dutch, and becoming confused and agitated. After Trouwborst received a diagnosis of Alzheimer's disease—a condition that also afflicted his siblings and father—in 2013, his daughter, Liz, learned about an NIR-emitting device called Vielight while attending a health expo.

After Trouwborst used the device for 25 minutes a day for a few months, his cognitive shortcomings dramatically improved. He again began speaking in English, sending e-mails, and maintaining eye contact.

The device's NIR light appears to travel through bone and deep

PREVIOUS SPREAD, LIGHT BOX: COURTESY OF CAREX. THIS SPREAD: PICCERELLA/GETTY IMAGES

into the brain, says Grover. When it illuminates red blood cells, they release nitric oxide, which opens small blood vessels that are constricted or damaged, which in turn improves blood flow. NIR light also appears to stimulate the production of new capillaries and neurons. “It’s similar to a tree growing new branches from sunlight,” Grover says.

In a study presented last year, researchers assigned 19 patients with dementia and mild cognitive impairment to receive either light therapy or a placebo over 12 weeks, followed by a 4-week treatment-free period. Those who received the therapy showed significant improvement after 3 months. They reported better sleep, fewer angry outbursts, and decreased anxiety.

These benefits appear to extend to brain injuries. In a 2014 study done at Boston University, researchers applied red and NIR wavelengths to the scalps of people with mild traumatic brain injuries for 30 minutes three times a week for 6 weeks. The subjects showed improved cognition and memory, plus enhanced ability to think clearly and manage daily activities. After 18 treatments, patients reported improved sleep and fewer symptoms of post-traumatic stress disorder.

One patient, a vice president of a financial firm who had suffered a brain injury in a car accident, couldn’t manage his personal finances for 5 years—but after 6 weeks of LED treatment on his head, he was balancing his checkbook again, Naeser says. Another brain injury patient, a man who had been hurt when he was pulled into a blast furnace, battled nightmares every night for 2 years after the incident. “Three weeks into the LED treatment,” Naeser recounts, “the nightmares stopped.”

Beacons of Hope

All these advances aside, research into light therapy is still in its infancy. Experts in the field are few, studies are small, and funding—without the support of major pharmaceutical companies—is limited. Dosage is another issue. It’s no secret that light in the UV spectrum can be dangerous, and scientists haven’t yet done enough research to determine whether the blue, red, and NIR wavelengths pose any risks following lengthy treatments. “For now, selecting the best wavelength of light for a particular condition—and the best dosing regimen—is educated guesswork,” says Eells.

The FDA has approved red and NIR low-level laser therapy for the

treatment of pain (such as carpal tunnel syndrome), and dermatologists use higher-powered lasers to treat skin conditions such as psoriasis. But the FDA has not yet signed off on using them to treat Alzheimer’s, PTSD, traumatic brain injury, stroke, or wounds. Despite these limitations, the therapeutic-light industry is booming. Cold laser devices, infrared saunas, and heat lamps—sold everywhere from dermatology offices to Amazon—are being used to promote healing of an array of disorders.

“Light is something everyone can access,” says Naeser. Though scientists haven’t yet unlocked all the therapeutic possibilities for red and NIR light, she predicts these types of therapy will be used to treat diabetic ulcers and the aftereffects of stroke and other brain disorders, among other conditions, within 5 years. Researchers point out another positive: Patients can be trained to use LEDs at home.

Someday, treatment might begin with just a flick of a switch. [▶](#)

SEEKING THE LIGHT

Want to explore light therapy?
Here are four common questions, answered.

HOW CAN I FIND A DOCTOR WHO USES IT?

There’s no clearinghouse for physicians who use light therapy, so your best bet is to ask your doctor for a referral or search online to find one in your area.

HOW CAN I JOIN A CLINICAL TRIAL?

Visit clinicaltrials.gov. You can search by health condition or by using “light therapy” as a

keyword. Clicking on a study title will bring up eligibility criteria.

HOW DO I KNOW WHICH PRODUCT TO CHOOSE?

Hundreds of devices that use light therapy are available online, so plan to do some reading. The best products will typically provide extensive information about the research, development, and science behind them. Look for the

phrase “medical-grade technology,” and expect a steep price tag. “Don’t go for the one you see on TV at 2 AM,” says Janis Eells, a University of Wisconsin–Milwaukee researcher.

IS LIGHT THERAPY COVERED BY INSURANCE?

Most insurance companies still consider it experimental, so coverage varies. Ask your provider. —Alyssa Jung