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Red light therapy benefits, research & mechanism of action

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Sat, 03 Jun 2017 08:08 UTC



Through emitting red, low-light wavelengths through the skin, red light therapy helps naturally jump-start the process of tissue recovery and other forms of rejuvenation through increased blood flow, [collagen](#) stimulation and more. 2010 marked the 50th anniversary for medical laser treatments like red light therapy, providing a host of evidence on their benefits. (1)

If you've never heard of red light therapy before, you might already be familiar with other terms that are used to describe this treatment, such as low level laser therapy (LLLT), biostimulation (BIOS), photonic stimulation or simply light box therapy. Red light is considered "low level" because it works at an energy density that's low compared to other forms of laser therapies.

Red light therapies have come a long way, but do they really work? Clinical studies show that, yes, red lightbox therapies have certain healing capabilities and medical applications thanks to the way they positively affect the human endocrine and immune systems. LLLT is now FDA-approved for treating conditions like [chronic joint pain](#) and slow-to-heal wounds. In the near future, we can expect approval for many more conditions thanks to red light benefits, such as increased immunity, tissue repair, anti-aging effects, improved joints and more.

What Is Red Light Therapy?

Red light therapy involves having low-power red light wavelengths emitted directly through the skin, although this process cannot be felt and isn't painful because it doesn't produce any heat. Red light can be absorbed into the skin to a depth of about eight to 10 millimeters, at which point it has positive effects on cellular energy and multiple nervous system and metabolic processes.

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Red light therapy has shown promise for treating symptoms of joint pain or osteoarthritis due to aging, those caused by [cancer treatments](#) like chemotherapy or radiation, hair loss, wounds or incisions, acne, wrinkles and skin discoloration, chronic muscular pain, neurological damage, and tissue damage (often at the root of tears, sprains or pulls). As you'll learn, even *seeing* the color red is physically stimulating, primes our senses and gets our blood pumping, so imagine what red light penetrating right into your body can do.

Although there is still controversy over this treatment and more research needed, according to the company Light Therapy Options LLC, there are virtually "no known adverse side effects" of red light therapy treatments, rather a growing list of many anti-aging benefits. (2)

Some of the ways that red light wavelengths work are: (3)

- Increasing energy levels by promoting release of ATP from [cells' mitochondria](#) (4)
- Stimulating DNA/RNA synthesis (5)
- Activating the [lymphatic system](#), an important part of our immune system that helps carry waste out of the body
- Increasing blood flow/circulation, thereby helping bring more oxygen and nutrients to our cells and tissues
- Forming new capillaries (small blood vessels)
- Improving natural production of collagen and [fibroblasts](#), important for things like skin, joint and [digestive health](#)
- Repairing and restoring damaged soft connective tissue
- Stimulating or decreasing inflammation, which helps control our natural healing capabilities
- Lowering effects of oxidative stress/[free radical damage](#), which is associated with many effects of aging

5 Benefits of Red Light Therapy

1. Increased Immunity and Reduced Side Effects of Cancer Treatments

Research done by NASA in conjunction with the University of Alabama at Birmingham Hospital has shown that red light technology can successfully reduce symptoms experienced by cancer patients, including painful side effects caused from radiation or chemotherapy. Using far red/near-infrared light-emitting diode devices (called High Emissivity Aluminiferous Luminescent Substrate, or HEALS in this case) has been shown to release long wavelength energy in the form of photons that stimulate cells to aid in healing.

NASA tested whether HEALS could treat oral mucositis in cancer patients, a very common and painful side effect of chemotherapy and radiation, and concluded that 96 percent of patients experienced improvement in pain as a result of the HEALS treatment. Patients received the light therapy by a nurse holding the WARP 75 device, which is roughly the size of an adult human hand. The WARP device was held close to the patient's face and neck for only 88 seconds daily for 14 days. Researchers stated, "The HEALS device was well tolerated with no adverse affects to bone marrow and stem cell transplant patients....The HEALS device can provide a cost-effective therapy since the device itself is less expensive than one day at the hospital." (6)

Similar HEALS technology is also now being utilized for the treatment of pediatric brain tumors, slow-healing wounds or infections, diabetic skin ulcers, and serious burns.

Light in the spectral range of 600 to 1,300 nanometers has been found to be useful for promoting wound healing, tissue repair and skin rejuvenation, although it does this through a different mechanism of action compared to many other laser resurfacing treatments. Most laser therapies used in dermatology offices use intense pulsed light to promote skin rejuvenation by inducing secondary tissue repair. In other words, they cause intentional damage to either the epidermis or the dermis of the skin in order to trigger inflammation, followed by healing.

Red light therapy actually bypasses this initial destructive step and instead directly stimulates regenerative processes in the skin through increased cellular proliferation, migration and adhesion. Red light therapy has been shown to positively affect skin cells through regeneration of fibroblasts, [keratinocytes](#) and modulation of immune cells (including mast cells, neutrophils and macrophages) all found within skin tissue.

3. Anti-Aging Effects for Skin and Hair Loss

One use of red light laser therapy that's growing in popularity is reversing signs of [aging on the skin](#) (i.e, wrinkles and fine lines). Results from a 2014 study published in *Photomedicine and Laser Surgery* demonstrated both efficacy and safety for red light therapy in promoting anti-aging skin rejuvenation and intradermal collagen increase when compared against controls. (7) Researchers concluded that red infrared therapy "provides a safe, non-ablative, non-thermal, atraumatic photobiomodulation treatment of skin tissue with high patient satisfaction rates."

Subjects treated with red light therapy experienced significantly improved skin complexion, improved skin tone, improved texture/feeling, reduced skin roughness, reduced signs of wrinkles and fine lines, and increased collagen density as measured through ultrasonographic tests. Patients with [rosacea](#) and redness have also found relief using LLLT, even those who are unable to tolerate higher-heat laser therapies.

Yet another anti-aging effect of red light therapy is [reversing hair loss](#) and stimulating follicle growth, which works in many of the same ways as red light therapy for wound healing. Results have been mixed according to studies, but at least a moderate portion of both male and female patients have had positive results for reversing baldness/hair loss when using LLLT. (8)

4. Improved Joint and Musculoskeletal Health

Red light therapy is now being used to treat arthritis symptoms thanks to its capability of stimulating collagen production and rebuilding cartilage. A 2009 Cochrane review of red light therapy for [rheumatoid arthritis](#) concluded that "LLLT could be considered for short-term treatment for relief of pain and morning stiffness for RA patients, particularly since it has few side-effects." (9)

Even in those who don't suffer from arthritis but have other signs of tissue damage or degeneration due to aging, LLLT can still be beneficial. A 2009 study published in *The Lancet* showed, "LLLT reduces pain immediately after treatment in acute neck pain and up to 22 weeks after completion of treatment in patients with chronic neck pain." (10) Other studies have found that even when patients with musculoskeletal disorders don't experience less pain from red light therapy treatments, they have a high chance of experiencing "significantly improved functional outcomes," such as better range of motion. (11)

Cellular rejuvenation and increased blood flow due to red light therapy are two key aspects of improving joint and tissue health. Decreasing oxidative damage, which degenerates joints, and

5. Reduced Depression and Fatigue

Another way to explain the benefits of red light is through the lens of Eastern medicine. Ask a [Traditional Chinese Medicine](#) practitioner how light helps improve health, immunity and recovery, and he or she will likely compare it to [acupuncture's](#) mechanism of action:

- Light is a form of energy, and our bodies are just big energy systems. Light has the power to stimulate specific meridian points and [chakra](#) zones in the human body.
- Red is said to stimulate the first chakra because it correlates most strongly with our survival instinct (hence why it gives us energy and makes us act quickly, in order to motivate us to pursue things like money, food, sex, power, etc.).
- While acupuncture uses tiny needles to achieve bodily harmony through stimulating certain points in the body's energy system, light therapy uses focused, visible, red wavelengths in much the same way.

Red light has been shown to be naturally energizing and correlated with improved moods by increasing self-confidence, positivity, passion, joyfulness, laughter, social awareness, conversation skills and sensory stimulation. While results vary from patient to patient, there's reason to believe that LLLT has mental and emotional perks in addition to physical benefits.

Red Light Therapy vs. Blue Light Therapy: What's The Difference?

- Blue and red light therapies, two forms of [phototherapy](#), have some similar benefits and uses, although they work in different ways. The mechanism of action of both is still not entirely well-understood, but it's believed that LLLT devices produce light with wavelengths similar to those of blue light lasers only with broader output peaks (they're less monochromatic and don't produce heat or friction).
- Blue light is more commonly used at home from light-emitting devices, especially for the [treatment of acne](#). It's been found that blue light reaches the sebaceous (oil) glands in the skin and can help kill porphyrins, which are compounds inside acne bacteria. ([12](#))
- Red light is believed to penetrate the skin deeper and may also help acne and other skin disorders by reducing inflammation and improving healing.
- Blue light and red light can be emitted from tabletop light therapy devices (which are used at home and usually weaker, requiring about a total of 30 minutes to one hour of treatment time twice per day) or from stronger devices used in doctors' offices that work quicker (sometimes within just several minutes or less).
- The Wellman Center for Photomedicine at Massachusetts General Hospital explains that there's still widespread uncertainty and confusion surrounding the mechanisms of action of these light therapies, especially LLLT, at the molecular, cellular and tissue levels. There are also a large number of parameters for doctors to consider before treating individual patients (wavelength, fluence, irradiance, treatment timing and repetition, pulsing, and polarization) that can add to the confusion and patient variability in terms of results. ([13](#))

Where to Go and How to Use Red Light Therapy

Many conventional doctors consider red light therapies to still be alternative treatments, considering more research is needed overall to prove their efficacy and results can sometimes vary. Currently most medical insurance companies state that LLLT is an "experimental treatment" so many won't provide insurance coverage. Depending on what condition you're treating, you can speak with your dermatologist, oncologist, orthopedic, rheumatologist or

give you a referral.

Red Light Therapy Research and Historical Use

Different types of phototherapy light boxes have actually been used for decades to treat numerous mood-related, skin, sleep-related, and acute or chronic pain conditions.

A 2012 report published in *Annals in Biomedical Engineering* stated that red light is used in three primary ways: "to reduce inflammation, edema, and chronic joint disorders; to promote healing of wounds, deeper tissues, and nerves; and to treat neurological disorders and pain." (14) It's been found that red light therapy promotes stronger immunity and longevity by increasing cell proliferation and migration, as well as modulating levels of cytokines, growth factors and inflammatory mediators.

Starting in the late 1990s, NASA scientists began developing infrared light technologies that could be used for plant growth during shuttle missions. What they discovered over the past two-plus decades is that red light therapies could also provide healing cellular stimulation in humans and animals.

Here's an overview of how red light therapy is believed to be effective:

Red light — even just seeing the color red — stimulates all of our senses, primes us for quick movement and deliberate action, and enhances courage. Because it grabs our attention, you've probably noticed that the color red is used on many warning signs and traffic signals in order to cut through clutter and alert us of danger. So what does the effect of seeing red have to do with healing?

[Leanne Venier](#) — an engineer, scientist and an expert in light frequencies and the healing effects of color therapy — explains that red light is naturally attention-getting, energizing, stimulating and "representative of survival, joy and passion" in humans because of how it affects our central nervous system. According to her work, along with extensive research done by trustworthy organizations including NASA, red light can trigger the sympathetic nervous system and therefore activate the "[fight or flight response](#)."

Being in fight-or-flight mode causes reactions like improved blood circulation, rapid heartbeats, increased sweating, high concentration and so on. Normally we think of activating our stress response as a bad thing, but this can also be healing because it carries nutrients to our cells and controls inflammatory responses.

Possible Side Effects/Cautions Regarding Light Therapy

Although red light therapy seems to be very well-tolerated and unlikely to cause side effects, it still remains controversial whether it can help all patients. One difficulty that researchers have had gathering results from studies on red light therapy is pinpointing which light ranges are optimal for treating different health conditions and different patients.

Certain published study results have found that LLLT can cause negative reactions when an inappropriate choice of light source or an inappropriate dosage is used. There is an optimal dose of light for any particular application, and in the case of red light therapy, often lower doses are found to be more effective than higher doses. Be sure to work with a qualified LLLT practitioner whenever receiving treatments, and report any side effects, including burning, swelling, dizziness, muscle weakness or nausea. Keep in mind that seeing results from red light treatments might take patience and that responsiveness is expected to vary.

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Final Thoughts on Red Light Therapy

- Red light therapy (sometimes called LLLT or low level laser therapy) involves emitting red, low-light wavelengths through the skin to stimulate cellular rejuvenation, increase blood flow, stimulate collagen and more.
- Red light therapy/LLLT is used to help treat conditions such as cancer treatment side effects, wounds, wrinkles or fine lines, hair loss, arthritis symptoms, musculoskeletal disorders, and neurological damage.
- Red light therapy is well-tolerated by most, but results can vary. Researchers and experts feel there is still a lot to learn about how color/light laser therapies work, which means they remain controversial and not always covered by insurance.

Comment: For a most instructive conversation on the benefits of light therapy, listen to [The Health & Wellness Show: Seeing the Light with Dr. Alexander Wunsch](#) (transcript available)

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