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**Red Light Therapy 101**

We are not just made of biochemical matter. We are charged energy beings, constantly interacting with the environment. Light plays a crucial role in this natural process. Comprehensive new research has unearthed a full new understanding of how our cells function optimally. Food is not the only way we obtain energy; the light also charges us.

Science now shows your body operates like a battery. Certain wavelengths of sunlight power it, and your general health is determined by your ability to receive and maintain a charge. This is what light therapy is about.

**What is Red Light Therapy**

Light at certain wavelengths is scientifically proven to interact with the body in beneficial ways.

Red light, comprising both red and near-infrared wavelengths, is a unique healing part of the electromagnetic spectrum, and it is one of the most natural ways to charge the body. It is now used as a new form of therapy under the umbrella term Photobiomodulation(PBM)

Red light wavelengths ranging from 600–680nm. Red light boosts the formation of collagen and elastin and assists in cell communication. It penetrates superficially and can be used for skin conditions.

Near-Infrared wavelengths ranging from 750–850nm. NIR stimulates healing, increases mitochondrial function, and improves blood flow and tissue oxygenation. It penetrates deeper into the body.

A high-quality home device like ours uses medical-grade LEDs to shine natural red and near-infrared light on your body. Like the wavelengths of light your body needs from natural sunlight, without the heat or UV rays that cause sun damage and without the need for sunny weather.

**How to Recharge your Body**

Electric charge is a fundamental property of the body. The surfaces in our bodies — such as membranes, proteins, and DNA — are all charged, negatively or positively, depending on whether they lose or gain electrons.

At the core of your body’s power to heal itself are sub-cellar organelles called mitochondria. The number of mitochondria in a cell varies widely by organism, tissue, and cell type and are concentrated in organs with high energy demands such as the brain, heart, liver, skin, and muscles.

This is because mitochondria generate most of the body's chemical energy supply via the ATP (adenosine triphosphate). They also regulate various other tasks, such as signaling, cellular differentiation, and maintaining control of the cell cycle and cell growth. This is why they are often referred to as the powerhouse of the cell.

**Mitochondria**

1. LED light at a wavelength from 600–680nm(red) and between 810–850nm(infrared) is delivered to the tissue via the red light therapy device.
2. The light enters the cell’s mitochondria and is absorbed by the chromophores, including the protein cytochrome c oxidase(CCO) and EZ water, increasing its activity.
3. As a result of this highlighted activity, three molecules are affected. Adenosine Triphosphate(ATP), Reactive Oxygen Species (ROS), and Nitric Oxide (NO).

**What Does “Red Light Therapy” Mean?**

As a term, “red light therapy” refers to treatments from LEDs or cold lasers that deliver wavelengths of natural red and near-infrared light.

The term does not include white light, blue light, or blue LED masks, and it is not the same as full-spectrum light. Some people may include infrared or far-infrared wavelengths along with red light therapy, but those are typically used in dry saunas because of their ability to produce heat. Red light therapy does not rely on heat, a major difference between natural light treatments and heat-based modalities like an infrared sauna, traditional sauna, or other heat therapy type.

Generally, “red light therapy” describes natural light treatments that deliver the same therapeutic red and near-infrared wavelengths as natural sunlight. This differs from artificial light treatments like tanning — or bright light therapy from light therapy lamps, lightboxes, or happy-light if you’re interested in natural light treatments for seasonal affective disorder.

The following terms may also call red light therapy: RLT, photobiomodulation (PBM), phototherapy, LED therapy, LED light therapy, infrared therapy, low-level laser therapy, or low-level light therapy (LLLT).

**A Multilevel Treatment**

Red light therapy works on multiple levels in the body.

Molecular

* Chromophores, cytochrome c oxidase, water, opsins
* Retrograde mitochondrial signaling
* Light-sensitive ion channels
* Adenosine triphosphate ATP
* Reactive Oxygen Species ROS

Calcium

* Heat-shock proteins
* Melatonin
* Brain-derived neurotrophic factor
* Gene transcription factors
* Akt/mTOR/CyclinD1 pathway

Cellular

* Inflammation, Cytoprotection, Proliferation
* Protein synthesis
* Stem cell production and migration
* Immune cell viability
* Retrograde mitochondrial signaling
* Transforming growth factor
* Pro-and anti-inflammatory cytokines
* Vascular endothelial
* Mitochondrial membrane potential

Tissue

* Muscles: Increase endurance, tone density
* Brain: Improves cognition and immune
* Nerves: Repair and pain relief
* Healing: Bones, tendons, and wounds
* Hair: Increases growth
* Skin: Improvements of the collagen network, anti-aging, skin disorders
* Fat: Fat re-absorption improved by enhanced micro-circulation
* Lymph: Improved immunity

**Systemic Effects**

Red light therapy affects multiple bodily systems:

**Fascia**

The fascia is a complex web of sensitive and highly interconnected connective tissue beneath the skin that attaches, stabilizes, encloses, and separates muscles and other internal organs.

Fascia is primarily made from hydrated collagen-Protein chains in a triple helix formation surrounded by water, with a capacity to generate an electric charge in response to applied mechanical stress (piezoelectric).

The bio-electrical nature of the collagen-rich matrix is the key to understanding how pathological changes in one part of the body may cause a cascade of “remote effects” in seemingly unrelated areas and organ systems. The fascia is the long-overlooked but absolutely crucial interconnecting organ of the human body. The therapeutic effect of red light energy can be carried through the fascia network to other parts of the body where it is needed. This is turn, elevates the body’s capacity to communicate via this charged matrix in a positive feedback loop.

The well-known energy meridians of traditional Chinese medicine may actually be low resistance pathways operating through the fascia, conveying energy to the rest of the body.

**Gut-Brain Axis**

The gut-brain axis links the emotional and cognitive center of the brain with peripheral intestinal functions. Red light energy applied to the abdomen area can therefore influence mood and neuropsychological issues via several mechanisms:

* Reduction in bowel inflammation and gut spasms.
* Stimulation of neurotransmitters and hormones in the gut, including serotonin, leptin, and ghrelin.
* Modulation of the micro-biome. The gut microbes are sensitive to light energy and respond to light energy with differences in growth, migration, and proliferation of the different species.
* The increasing availability of neurotransmitters activates the brain’s immune system, increases blood flow, and removes toxins.
* Increased blood circulation and reduced blood pressure leading to a reduction of anxiety and brain fog.
* Modulation of the vagus nerve, one of the biggest nerves connecting the gut and brain. This plays an important role in stress and social communication, communicating motor and sensory impulses to every organ in the body.

**Immune System**

Beaming red light and near-infrared light onto cells creates a short, low-dose metabolic stress that builds up the cells' anti-inflammatory, anti-oxidant, and natural defense systems, making the body stronger and more resilient to infections.

This is the concept of hormesis; safe, low-level exposure to stressor results in increased resistance to illness. Red light has been shown to influence the immune response in several ways:

* Activation of the mast cells leading to the movement of leukocytes and reduced inflammation.
* Mast cell DE-granulation and the release of pro-inflammatory cytokines.
* Increased infiltration of the tissues by leukocytes.
* Enhanced proliferation, maturation, and motility of fibroblasts
* Increased production of fibroblast growth factor.
* Lymphocyte activation and proliferation.
* Macro-phages activated to act as phagocytes.

**Circulatory System**

Red light therapy has been shown to aid the circulatory system's functioning and increase the micro-circulation of blood, one of the most recognized and well-documented effects of this therapy.

Red light stimulates the formation of new capillaries carrying more oxygen to the body.

A good oxygen supply is intricately involved in numerous biological processes, including cell proliferation, angiogenesis, and protein synthesis, required to restore tissue function and integrity.

Increased circulation allows for waste products to be carried away more effectively. It triggers and heightens the body’s own scavenging process for and ingesting degenerated cells for clean-up.

In fact, increased micro-circulation of blood is thought to be the most vital function for healing the body for almost every illness. For general well-being, Nutrient-rich blood and efficient waste removal is strongly linked to good health.

**Nervous System**

The nervous system is a complex electrical system, including the brain and spinal cord. It collects, processes, and responds to the input of energy-be it light, sound, heat, or pressure — and it relays these messages to the brain and around the body.

Red light energy affects the nervous system in several crucial ways:

* Myelination of fibers and a better lamellar organization of the myelin sheath.
* Improvement of electrophysiological function.
* Facilitation of neural regeneration.
* Release of growth factors.
* Increase of vascular network and collagen.
* Faster regeneration of nerve lesions and functional improvement of damaged nerves.

The peripheral nerves can be damaged by infection or high sugar levels in the case of diabetic neuropathy.

Red light therapy is being explored as a promising drug-free therapy for all kinds of nerve damage.

**Stem Cells**

At the frontier of science, red light therapy shows huge promise in current research to stimulate the growth of stem cells in the body and maximize the effect of stem cell implantation for a wide variety of medical purposes.

Therefore, red light may be useful after surgery to stimulate stem cells to aid the repair of tissues and possibly organs.

Light at certain wavelengths has also been shown to coax stem cells to repair teeth, so red light therapy could soon revolutionize dental treatments. Indeed, some progressive dental clinics now offer red light therapy as an alternative to conventional drug and drill treatments.

Red light therapy has been shown to stimulate mesenchymal stem cells in the bone marrow to enhance their capacity to infiltrate the brain.

This has implications for healing degenerative conditions such as dementia, Alzheimer’s, and Parkinson’s disease , currently lacking any orthodox treatment solution.

**Where Did Red Light Therapy Come From?**

Red light therapy has become a popular natural health intervention, both in professional settings and with home devices.

Light therapy technology has been used in medicine for decades, and NASA experimented with red light therapy use in space in the 1980s and 1990s. In the last 10–20 years, red light therapy has become more widely used thanks to breakthroughs in LED lighting technology that have made affordable home devices possible.

Major advances in clinical light therapy research, and increased public interest in natural health technologies, have also contributed to the growing use and popularity of red light therapy.

**Relieve Pain And Discomfort**

In humans, photobiomodulation is reportedly effective against various pain conditions, including mucositis, carpal tunnel syndrome, orthodontic pain, temporomandibular joint pain, neck pain, neuropathic pain from amputation, and menstrual cramps.

Red light therapy significantly reduces the severity of pain hypersensitivity while improving sensorimotor function.

These improvements are preceded by an anti-inflammatory microglia/macrophage cell population in the injury zone, thereby providing a lasting pain relief effect.

Red light therapy has been shown to yield effective pain relief via the modulation of multiple mechanisms:

* Inhibitory cyclooxygenase and prostaglandins
* Modulating nerve transmission
* Increasing endorphins serotonin release
* Stimulating metabolism
* Activating peripheral opioid receptors

**Repair Skin**

Red light therapy is used for the rapid and safe healing of wounds from burns, surgery incisions, scars, diabetic neuropathy, ulcers, and bedsores.

Faster and better wound healing was one of NASA’s original findings and one of the key recognized uses for this technology. Red and near-infrared light promote beneficial effects during all four phases of the wound-healing process:

* Coagulation
* Inflammation
* Migration
* Remodeling

These processes are regulated by many growth factors connected with nitric oxide (NO) signaling release, which is modulated by light energy.

A major typical inhibiting factor for the body’s ability to recover from a wound is low oxygen flow. Therefore, the unique ability of red light to increase oxygen flow to the affected area has a massive effect on the healing process.

By reducing inflammation, oxygenation of the area, and formation of new blood vessels, a rapid healing process unfolds with less pain and scarring.

Red light energy may also reduce or prevent the need for pharmaceutical painkiller medication during the healing process.

**Revive Immunity**

If your body is energized on a cellular level and communication between the organ systems is efficient, your body will naturally develop disease resistance.

Your immune defense works to fend off bacteria and viruses all the time. Red light therapy boosts this system in several ways.

It releases nitric oxide and melatonin, which are involved in DNA repair and have a powerful antimicrobial effect.

It also works through a process known as hormesis. When red and near-infrared light is beamed into cells, it causes mild metabolic stress, which results in cells engaging their anti-inflammatory and antioxidant response.

In this way, the body is primed and ready to respond better to infections. Boosted immunity is also a natural consequence of other systemic effects of red light therapy.

Studies have shown a variety of benefits to the immune system:

* Improved melatonin production
* Improved antioxidant production
* Increased micro-circulation enabling the transportation of immune cells.
* Promotes activity in the lymph nodes
* Increased NO levels
* Better flow of neurotransmitters
* Boosted collagen and elastin production
* The more efficient function of cells and organelles
* Boosts T cells pre-operatively
* Improved thyroid function

**Reduce Inflammation**

Inflammation can be acute and topical ( short-lived, caused by accidents, sprains, and infections ), chronic and general ( long-term, caused by persistent conditions ).

While acute inflammation is a healthy physical healing response, chronic and general inflammation can be detrimental to health and often goes undetected.

Currently, the main treatment for inflammation in the body is NSAID or steroid drugs, both of which have side effects and disrupt the body's healing process. Red light therapy stimulates the body to activate its own healing mechanism, dramatically reducing the health risks associated with long term drug use.

Red light therapy works by decreasing the number of inflammatory cells, increasing fibroblast proliferation ( the cell that synthesizes the extra-cellular matrix and collagen ), stimulating angiogenesis ( the formation of new blood vessels ), and activating the body’s innate anti-inflammatory, antioxidant defenses.

The following conditions, associated with chronic and acute inflammation, are currently being investigated as highly promising targets for red light therapy.

* Arthritis
* Asthma
* Sinusitis
* Muscular sprains
* Fibro-myalgia
* Neuron inflammatory disorders such as Alzheimer’s
* Irritable bowel syndrome and colitis
* Rheumatic conditions

**Regain Performance**

Red light therapy has become a hot topic in sports and performance. Not only is it safe and non-toxic-it yields rapid and lasting results in many areas of application.

Besides the overwhelmingly beneficial effects on health overall, red light therapy supports muscle growth and repair by increasing the amount of ATP available, which allows for better performance and faster recovery.

Red light therapy used before training is known to prepare and strengthen the body and physical exertion to help with recovery.

Documented effects from red light therapy include:

* Reducing DOMS ( Delayed Onset Muscle Soreness )
* Greater endurance and performance
* Improving sleep quality
* Increasing sexual function and libido ( Including Testosterone )
* Aiding weight loss
* Boosting cognitive function
* Reversing skin aging
* Reducing cellulite

**Red Light Therapy for Depression and Seasonal Affective Disorder**

 Seasonal affective disorder (SAD) is a type of depression that impacts at least 5% of Americans, especially in the winter months, when natural light exposure is lowest. SAD is also called seasonal depression, winter depression, or the winter blues.

Some people treat SAD symptoms with treatment options like bright white light therapies that mimic the sun’s light intensity at a bright time of day.

More researchers and physicians have used natural light treatments like red light therapy to help with natural light deficiency and the winter blues in recent years in conjunction with antidepressant medication and psychotherapy.

**Who Uses Red Light Therapy?**

 In addition to the growing number of people using red light therapy devices in their home, red light therapy systems can be found in many professional and clinical settings:

**Skincare Professionals**: Red light therapy is a popular skin treatment among Hollywood celebrities for anti-aging, and it’s used by leading skincare professionals like estheticians and dermatologists to treat skin conditions and promote collagen production.

**Health Practitioners**: Red light therapy is an emerging subspecialty of medicine in a wide range of fields. From oncologists treating cancer side effects, to dentists reducing oral inflammation, to physicians treating mental health conditions, red light therapy is becoming more widespread in clinical practice.

**Natural Health Experts**: Leading voices in natural health and wellness like Dr. Sarah Ballantyne, Dave Asprey, and Ben Greenfield use red light therapy. So do Paleo and Keto health experts like Mark Sisson, Dr. Anthony Gustin, Luke Storey, and Robb Wolf.

**Sports Medicine Pros**: Light therapy companies work side by side with the National Association of Sports Medicine (NASM), and red light therapy is used to heal sports injuries by sports medicine professionals across the globe. Including the top trainers and doctors on the PGA Tour, like Dr. Troy Van Biezen and Dr. Ara Suppiah.

**Elite Pro Athletes**: Red light therapy is a popular training tool across pro sports, from NFL stars like Patrick Peterson, to UFC champs like Anthony Pettis, to gold medal gymnast Sanne Wevers.

**Fitness & Training**: World-class personal trainers like Lacey Stone and Jorge Cruise use red light therapy to both enhance performance and improve the muscle recovery process.

**Supportive Cancer Care**: The Multinational Association of Supportive Care in Cancer (MASCC) recommends red light therapy for the treatment of oral mucositis (OM), a common and debilitating symptom of cancer treatment.