

Well Being: Let There be Light

Near red light or photobiomodulation (PBM) therapy



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We were in Toronto a few weeks ago and Jill ended spending time speaking with a researcher named Tom Kerber, who specializes in NearRed light therapy. Jill had a major horse related accident (a trimalleolar fracture with displacement) a few years ago, and has very little feeling in her foot . She often has significant nerve pain (neuropathy), as well as a large metal plate and screws in her ankle, which cause tissue damage if she stresses the area too much. Therefore, anything which might help has been of interest, and the topic of combined visible and near infrared spectrum light therapy for treatment of tissue damage has been a subject near and dear to her heart. She had been using a photobiomodulation (PBM) device that she bought off of Amazon, but really felt that it was sub-optimal. Out of the kindness of his heart, this wonderful Canadian man (Tom Kerber) ended up giving her a very nice unit to try out. This hand held unit ([SunPowerLED Palm](#)) is therapeutic grade and marketed for the healthcare community.

Fast forward to today, we just got home from a long week of travel consisting of speaking engagements and somehow along the way, I ended up with another severe case of gout. So here I am, finally back on the farm from a week-long four city tour, nursing a foot full of needle-like pain, with a medical grade PBM device shooting light into my big toe joint. Even after a short time, the light feels like it is making a difference. I wonder if the deep heating produced by these penetrating wavelengths might help the uric acid crystals that have formed in my great toe joint to slowly dissolve?

What is Near Infrared Light Therapy?

Near infrared light therapy is an every-day term for the science of photobiomodulation. It uses invisible, near infrared wavelengths between 700 and 1200 nm to deliver energy to tissue and cells, stimulating healing and relieving pain. Infrared light therapy has been proven effective by hundreds of studies all over the globe, is 100% natural and has no known adverse side effects.

Some consider near red therapy (PBM) a “miracle drug.”

Near infrared light therapy is essentially the same as **red light therapy**, except infrared energy is invisible, and it penetrates the body deeper than red, reaching deep into soft tissues, muscles, joints, and bone.

Near infrared light therapy is where light therapy gets serious. The combination of red light therapy with near infrared energy is being researched for amazing things such as the reversal of traumatic brain injury, stopping and healing the debilitating effects of stroke and heart attack, and the regeneration of damaged nerves and severed spinal cords.

Near infrared light therapy has already been **FDA approved and is available in-home for the relief of chronic pain**. As with red light therapy, near infrared light therapy **does not mask the symptoms of pain, it encourages the healing of the actual cause of the pain** and so, in many cases, after a course of treatment with infrared light, the pain is gone for good.

The Wavelengths of Near Infrared Light Therapy

Infrared light immediately follows red light on the electromagnetic spectrum. Infrared (IR) light energy is broken down into three groups:

- **Near Infrared, also called infrared A (IR-A).** Near IR spans wavelengths 760 to 1,400 nm. Most home therapy devices use these wavelengths.
- **Mid Infrared, also called infrared B (IR-B)** – These wavelengths are used in many household electronic devices such as remote controls.
- **Far Infrared, or IR-C**– also known as long wave infrared , thermal infrared (thermal-IR). This is the largest part of the IR spectrum, used in **infrared saunas**.

Other names for Red light therapy are low-level laser therapy (LLLT), low-power laser therapy (LPLT), and photobiomodulation (PBM).

There are three types of light therapy available for medical purposes – the near-infrared (NIR) light, mid-infrared (MIR) light and far-infrared (FIR) light. Among the three, near-infrared light, ranging from 700 to 1400 nm, generates high heat that does not penetrate the body’s tissues. Within this range, infrared light can signal

the mitochondria to function by [increasing the body's metabolism, speeding up the regeneration of damaged tissues, and reducing inflammation](#).

Near-infrared light therapy is becoming popular because of its safety and benefits.

With red light therapy, you expose your skin to a lamp, device, or laser with a red light. A part of your cells called mitochondria, sometimes called the “power generators” of your cells, soak it up and make more energy. Some experts think this helps cells repair themselves and become healthier. This spurs healing in skin and muscle tissue.

Let's go over some of the peer reviewed studies and literature highlighting the benefits and drawbacks of this incredible therapy, that does not require drugs or surgical interventions to provide real benefits.

Dementia:

[Significant Improvement in Cognition in Mild to Moderately Severe Dementia Cases Treated with Transcranial Plus Intranasal Photobiomodulation: Case Series Report](#)

Photomed Laser Surg 2017 Aug;35(8):432-441. doi: 10.1089/pho.2016.4227.Epub 2017 Feb 10.

This study investigated whether patients with mild to moderately severe dementia or possible Alzheimer's disease (AD) with Mini-Mental State Exam (MMSE) Baseline scores of 10-24 would improve when treated with near-infrared photobiomodulation (PBM) therapy.

Results suggest that larger, controlled studies are warranted. PBM shows potential for home treatment of patients with dementia and AD.

[EEG-Validated Photobiomodulation Treatment of Dementia-Case Study](#) Sensors (Basel) 2022 Oct 5;22(19):7555. doi: 10.3390/s22197555.

“This case study suggests that *PBM* could have positive effects on improving desired brain activity, measured as improvement in power spectrum and connectivity measures in theta and alpha bands, for elderly people with memory and thinking disorders.”

NeuroInflammation and Inflammation:

[Photobiomodulation for the treatment of neuroinflammation: A systematic review of controlled laboratory animal studies](#)

Background: ... We systematically reviewed the effects of PBM on laboratory animal models, specially to investigate potential benefits of PBM as an efficient anti-inflammatory therapy.

Methods: We conducted a systematic search on the bibliographic databases (PubMed and ScienceDirect) with the keywords based on MeSH terms: photobiomodulation, low-level laser therapy, brain, neuroinflammation, inflammation, cytokine, and microglia. Data search was limited from 2009 to June 2022. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. The initial systematic search identified 140 articles. Among them, 54 articles were removed for duplication and 59 articles by screening. Therefore, 27 studies met the inclusion criteria.

Results: The studies showed that PBM has anti-inflammatory properties in several conditions, such as traumatic brain injury, edema formation and hyperalgesia, ischemia, neurodegenerative conditions, aging, epilepsy, depression, and spinal cord injury.

Conclusion: Taken together, these results indicate that transcranial PBM therapy is a promising strategy to treat brain pathological conditions induced by neuroinflammation.

Osteoarthritis:

Effects of photobiomodulation and a physical exercise program on the expression of inflammatory and cartilage degradation biomarkers and functional capacity in women with knee osteoarthritis: a randomized blinded study

Adv Rheumatol 2021 Oct 16;61(1):62. doi: 10.1186/s42358-021-00220-5.

Background: The knee osteoarthritis (OA) is a joint disease characterized by degradation of articular cartilage that leads to chronic inflammation. Exercise programs and photobiomodulation (PBM) are capable of modulating the inflammatory process of minimizing functional disability related to knee OA...

Methods: Forty-two patients were randomly allocated in 3 groups: ESP: exercise + sham PBM; EAP: exercise + PBM and CG: control group. Six patients were excluded before finished the experimental period. The analyzed outcomes in baseline and 8-week were: the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) and the evaluation of serum biomarkers concentration (IL-1 β , IL-6, IL-8, IL-10 e TNF- α , and CTX-II).

Results: An increase in the functional capacity was observed in the WOMAC total score for both treated groups ($p < 0.001$) and ESP presents a lower value compared to CG ($p < 0.05$) the 8-week post-treatment. In addition,

there was a significant increase in IL-10 concentration of EAP ($p < 0.05$) and higher value compared to CG ($p < 0.001$) the 8-week post-treatment. Moreover, an increase in IL-1 β concentration was observed for CG ($p < 0.05$). No other difference was observed comparing the other groups.

Conclusion: Our data suggest that the physical exercise therapy could be a strategy for increasing functional capacity and in association with PBM for increasing IL-10 levels in OA knee individuals.

Skin Wound Healing:

Noninvasive red and near-infrared wavelength-induced photobiomodulation: promoting impaired cutaneous wound healing

Photodermatol Photoimmunol Photomed, 2017 Jan;33(1):4-13. doi: 10.1111/phpp.12282.

Limitations of photobiomodulation therapy

PBM therapy has been practiced for more than five decades, and several positive clinical trials and laboratory studies have been reported. Despite impressive therapeutic benefits, PBM has still not achieved the stage of acceptance by mainstream medicine. The major limitations in this research field lie in two areas: first, uncertainty about the cellular and molecular mechanisms responsible for transducing signals from the photons incident on the cells to exert the bio-effects that take place in the irradiated tissues. Second, there are a large number of optical dosimetry parameters. These parameters are required to be standardized for each anomaly as there is more variation in the parameters of PBM for the treatment of the same type of injury. To overcome these limitations, recently researchers have given major emphasis on the understanding of substantial mechanistic insights, better guidelines with standardized protocols, consistency in radiant exposure parameters and systematically controlled clinical studies.

Conclusion

In aggregate, red and NIR light-induced PBM can be considered as a promising biophysical healing modality owing to its numerous applications. Standardization of optical parameters is the major pointing issue with this technique which varies for different maladies. Recently, NIR light has gained attention as a potential treatment strategy for both the acute and chronic dermal wound repair and regeneration. This article emphasized further research into the biological role of red and NIR lights on the dermal wound repair. NIR light penetrates more deeply into the skin, absorbed by distinct set of cellular chromophores, activates a unique set of molecular target, which in turn promotes repair, regeneration and cell survival, prevents apoptotic cell death and consequently processes the bio-effects on the dermal tissue that are different from other forms of spectral radiant energy.

The fast growing field of NIR light-induced PBM will continue to offer painless, potential noninvasive, drugless biophysical therapeutic intervention for chronic nonhealing dermal wounds, especially when conventional therapies have failed or have unaccepted side effects.

The development of such noninvasive, light-based healing therapies appears to be much needed to stay away from the threat of antibiotic resistance and the unwelcome side effects caused by pharmaceuticals.

Skin repair (including wrinkles):

Role of Photo-Biomodulation Therapy in Facial Rejuvenation and Facial Plastic Surgery.

Plast Surg. 2021 Apr;37(2):267-273. doi: 10.1055/s-0041-1722980. Epub 2021 Feb 15. PMID: 33588472

Photo-biomodulation (**PBM**) is being used in the cosmetic field for the treatment of **skin** conditions and **skin** rejuvenation.

Supportive Care for Cancer Treatment Side Effects:

Photobiomodulation therapy in management of cancer therapy-induced side effects: WALT position paper 2022

Front Oncol 2022 Aug 30;12:927685. doi: 10.3389/fonc.2022.927685. eCollection 2022.

Cancer:

Responses of melanoma cells to photobiomodulation depend on cell pigmentation and light parameters

J Photochem Photobiol 2022 Oct;235:112567. doi: 10.1016/j.jphotobiol.2022.112567. Epub 2022 Sep 13.

We conclude that PBM appears to be safe for amelanotic non-pigmented melanoma but triggers different responses in melanotic pigmented cells depending on light parameters. Additionally, a high dose of red laser impairs the invasive behavior of melanoma cells, probably due to the decrease in VEGF synthesis, which may have contributed to tumor arrest and increased mouse survival. These findings suggest that red laser therapy could be a new ally in the supportive care of melanoma patients.

Other types of cancers are being investigated. Stay tuned.

Clinical application of low-level laser therapy (Photo-biomodulation therapy) in the management of breast cancer-related lymphedema: a systematic review

BMC Cancer 2022 Aug 30;22(1):937. doi: 10.1186/s12885-022-10021-8.

Conclusions: The findings of this comprehensive study demonstrated that LLLT (PBM) was successful in diminishing arm circumference and volume than improving shoulder mobility and pain. Data indicates that laser therapy (PBM) may be a beneficial treatment option for females with PML. Because of the scarcity of evidence, there is a strong need for well-conducted and longer-duration trials in this field.

PBM is also used to treat wound healing, TMJ/TMD, neuralgia, facial pain, chronic pain, and mucositis.

Clearly, there is clinical benefit to PBM therapy for many, many diseases and conditions.

The problem is where to begin to learn more about this therapy.

Although there are many sales sites on line, and Amazon does sell some units that aren't trash, it is hard to figure out which are best.

First and foremost, consider consulting with a physician or trained specialist, if you have a significant health related issue or even if you are unsure about exploring options yourself. However, there are many other resources and units are sold over the counter.

[The PBM Foundation](#) is a good place for general information. Including various commercial companies selling these products.

[Laser Therapy University has lots of resources about PBM.](#)

[This page has many useful articles.](#)

These devices have many uses both for the healthcare community, as well as for in home therapies. If you have a condition that you are curious about, pubmed.gov is a great place to start looking for answers as are the links above.

Be smart, be careful but consider all your options for your own healthcare.