

LET THERE BE LIGHT



PHOTO•BIO•MODULATION

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The purpose of this document is to promote broad consumer understanding and knowledge of various health topics. **It is not intended to be a substitute for professional medical advice, diagnosis or treatment.** Always seek the advice of your physician or other qualified health care provider with any questions you may have regarding a medical condition or treatment and before undertaking a new health care regimen, and never disregard professional medical advice or delay in seeking it because of something you have read in this document



ARTIFICIAL LIGHT

Today we're bombarded by artificial light, by blue light, by LEDs, by halogens, by all these different forms of concentrated blue light that our ancestors have never experienced.

WELL IT TURNS OUT THAT RED LIGHT (ESPECIALLY THE SAME TYPE OF RED LIGHT WAVELENGTHS THAT WE WOULD GET IF WE WERE TO STEP OUT INTO THE SUN) CAN REVERSE A LOT OF THESE EFFECTS OF THE BLUE LIGHT AND ARTIFICIAL LIGHT.



BLUE LIGHT

The simplest way to use light to impact our performance is by hacking our internal **circadian rhythm**. Getting blue light (walk outside if it is sunny) can stimulate secretion of wakefulness hormones, which is why doing so in the morning is great and **avoiding it in the evening is imperative**.

BECAUSE THERE ARE SO MANY TECHNOLOGY DEVICES THAT EMIT BLUE LIGHT, IT'S A GOOD IDEA TO AVOID THIS LIGHT SPECTRUM LATE AT NIGHT AS IT WILL DISRUPT YOUR SLEEP.



SUNLIGHT

Why don't we spend more time in the Sun? There's 2 reasons for that:

1. In many cases, people are stuck in a home or an office or a cubicle and simply getting outside when you're supposed to be indoors working on a computer is not something that's feasible for you.
2. While sunlight is invaluable for vitamin D production, UV radiation can be harmful for the skin. Also, as red and near infrared light therapy can reduce inflammatory cytokines (markers of inflammation), UV radiation can increase inflammation.

SO BRINGING BENEFICIAL WAVELENGTHS IN ADDITION TO THE ONES YOU WOULD FIND IN SUNLIGHT IS CRITICAL TO DELIVER MORE POWER TO YOUR BODY.

SPECIFIC TARGETED USE OF LIGHT THERAPY, PARTICULARLY IN THE RED AND NEAR INFRARED WAVELENGTHS, CAN HAVE MORE DRASTIC BENEFITS WHILE REDUCING THE RISK OF SIDE EFFECTS.



RED & NEAR INFRARED LIGHT

Not all light is created equal and this is especially true when it comes to the human body. Blue light is great for entering our eyes and helping program our master clock, but red and near infrared light are effective for optimizing our performance beyond the norm.

THE RED AND NEAR INFRARED LIGHT SPECTRUM ARE IMPORTANT BECAUSE THEY ARE SCIENTIFICALLY PROVEN TO BE THE BEST IN ACTIVATING CYTOCHROME C OXIDASE (CCO) IN THE MITOCHONDRIA .

THIS INCREASES ATP PRODUCTION (ENERGY) BY THE MITOCHONDRIA, WHICH GIVES OUR CELLS MORE ENERGY

SOLEIMANPOUR, H., ET AL. (2014). "THE EFFECT OF LOW-LEVEL LASER THERAPY ON KNEE OSTEOARTHRITIS: PROSPECTIVE, DESCRIPTIVE STUDY." LASERS MED SCI 29(5): 1695-1700.



THE SCIENTIFIC EVIDENCE: LIGHT THERAPY CLINICAL RESEARCH & RESULTS

Light therapy, especially in the right wavelengths, could be one of the most well-researched and effective performance enhancers currently available.

IN 2016, THE NATIONAL INSTITUTE OF HEALTH DATABASE ADOPTED THE WORD PHOTOBIO-MODULATION (PBM) AS THE NEW SCIENCE HEADING KEYWORD FOR THE SCIENCE OF LIGHT THERAPY AND ITS TECHNOLOGY.

PHOTOBIO-MODULATION MORE ACCURATELY DESCRIBES THE PHYSIOLOGICAL MECHANISM(S) THAT RESULT FROM THE APPLICATION OF LIGHT TECHNOLOGY. YOU'LL FIND OVER 5000+ RESEARCH ARTICLES ABOUT PHOTOBIO-MODULATION AND ITS TECHNOLOGY ON THE PUBMED WEBSITE (WWW.PUBMED.GOV). USE THE FOLLOWING KEYWORDS: PHOTOBIO-MODULATION, LLLT (LOW LEVEL LIGHT THERAPY)

BENEFITS OF PHOTOBIOMODULATION



By increasing CCO (*cytochrome C oxidase*) and mitochondrial energy production, there are a number of downstream effects. Almost, if not all, benefits of photobiomodulation revolve around this major advantage.

COGNITIVE ENHANCEMENT



ACUTE EFFECTS OF NEAR INFRARED LIGHT THERAPY ON BRAIN STATE IN HEALTHY SUBJECTS AS QUANTIFIED BY QEEG MEASURES.

While less studied than some of the other photobiomodulation benefits, there is ample evidence to suggest substantial **cognitive enhancement** through light therapy. A 2017 study in Photomedicine and Laser Surgery showed that near infrared light therapy could increase reaction time with no adverse side effects

**WE DO KNOW THAT CYTOCHROME OXIDASE HAS A KEY ROLE IN
NEURONAL PHYSIOLOGY. THIS MECHANISM IS THE SAME AS
METHYLENE BLUE, WHICH INCREASES MEMORY FORMATION,
LEARNING, AND NEUROPROTECTION.**

REDUCED INFLAMMATION



PRO- AND ANTI-INFLAMMATORY CYTOKINE CONTENT IN HUMAN PERIPHERAL BLOOD AFTER ITS TRANSCUTANEOUS (IN VIVO) AND DIRECT (IN VITRO) IRRADIATION WITH POLYCHROMATIC VISIBLE AND INFRARED LIGHT.

Inflammation is one of the scourges of physical and mental performance. It contributes to pain, brain fog, and a host of other chronic diseases. The most insidious aspect of inflammation is that we can “survive”, but we’re definitely not thriving.

Although applying direct red and infrared light to an inflamed area (i.e: injury) can be extra helpful, simple application to the body changes inflammatory markers in the blood. One study showed reduced numbers of pro-inflammatory cytokines (like TNF-a) in the blood after only 30 minutes .

ON AVERAGE THE INFLAMMATORY MARKERS FELL BY 34, 12, AND 1.5 TIMES THE NORMAL AMOUNT. THE RED AND NEAR INFRARED THERAPY SEEMS TO REALLY MOVE THE NEEDLE IN TERMS OF INFLAMMATION (THESE AREN'T TRIVIAL AMOUNTS).

ANTI-AGING



Time takes a toll on us all, but red and near infrared light therapy can significantly reverse some signs of aging. This is most clearly seen with the skin.

One study showed using 20 minutes of 633 and 830 nm light (red and near infrared light therapy) could improve skin tone and reduce wrinkles in 91% of subjects [1]. Another showed that red and near infrared light therapy stimulated collagen production to reduce aging skin [2]. A final trial combined green tea with red light to find results that usually took 10 months were found in 30 days [3].

WHILE MOST OF THE CURRENT EVIDENCE FOCUSES ON THE SKIN (THERE ARE NO EPIDEMIOLOGICAL STUDIES OF PEOPLE EXPOSED PURELY TO RED AND NEAR INFRARED LIGHT), ONE CAN ASSUME SIMILAR RESPONSES WITHIN OTHER ORGANS OF THE BODY.

[1] BAEZ F, REILLY LR. J COSMET DERMATOL. 2007 SEP;6(3):189-94.

[2] BAROLET D, ROBERGE CJ, AUGER FA, BOUCHER A, GERMAIN L. J INVEST DERMATOL. 2009 DEC;129(12):2751-9. DOI: 10.1038/JID.2009.186. EPUB 2009 JUL 9.

[3] SOMMER AP, ZHU D. PHOTOMED LASER SURG. 2009 DEC;27(6):969-71. DOI: 10.1089/PHO.2009.2547.

WEIGHT LOSS



LOW-LEVEL LASER THERAPY FOR FAT LAYER REDUCTION: A COMPREHENSIVE REVIEW.

The studies as of today suggest that LLLT has a potential to be used in fat and cellulite reduction as well as in improvement of blood lipid profile without any significant side effects.

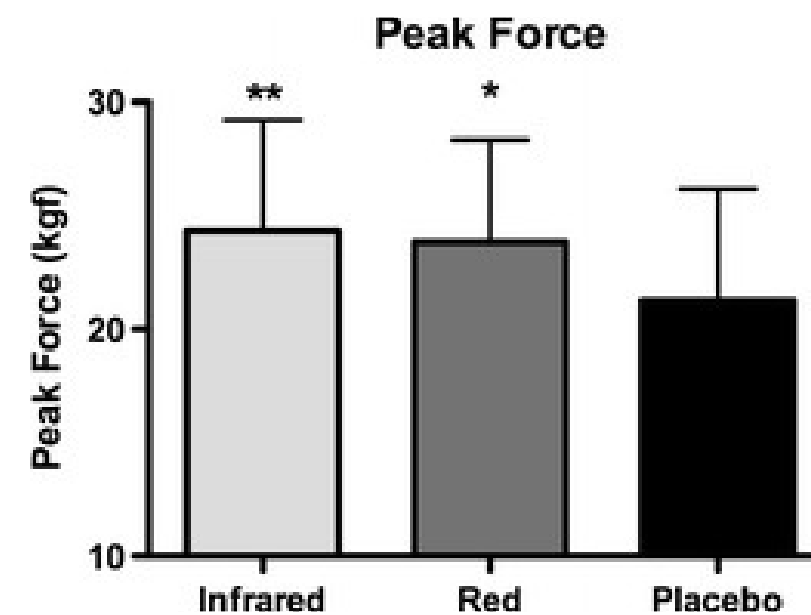
ONE OF THE MAIN PROPOSED MECHANISM OF ACTIONS IS BASED UPON PRODUCTION OF TRANSIENT PORES IN ADIPOCYTES, ALLOWING LIPIDS TO LEAK OUT. ANOTHER IS THROUGH ACTIVATION OF THE COMPLEMENT CASCADE WHICH COULD CAUSE INDUCTION OF ADIPOCYTE APOPTOSIS AND SUBSEQUENT RELEASE OF LIPIDS.

MUSCLE RECOVERY & ATHLETIC PERFORMANCE



RED (660 NM) AND INFRARED (830 NM) LOW-LEVEL LASER THERAPY IN SKELETAL MUSCLE FATIGUE IN HUMANS: WHAT IS BETTER?

Both red and infrared LLLT are effective in delaying the development skeletal muscle fatigue and in enhancement of skeletal muscle performance.



INCREASED TESTOSTERONE



IF FEMALES ENJOY THE SKIN REJUVENATING BENEFITS OF RED LIGHT THERAPY, MEN WILL ASSUREDLY LIKE INCREASING THEIR TESTOSTERONE. THE LIGHT (ESPECIALLY WHEN SHINED ON THE TESTIS) STIMULATES LEYDIG CELLS, WHICH INCREASE TESTOSTERONE PRODUCTION.

A study published in Biomedical Research showed that it only took 4 days to increase testosterone levels in animal models (30 min per day 670 nm wavelength) [1]. In that study plus another, using the wavelength of 808 nm had no impact, which shows that the wavelength does matter (red light specifically) [2].

Testosterone can increase muscle size and strength, but also has consequences for the brain. Low testosterone can reduce cognitive performance, mood, and accelerate signs of aging. Improving levels of testosterone can enhance mental performance.

[1] JIN-CHUL AHN, YOUNG-HOON KIM & CHUNG-KU RHEE, 2BIOMEDICAL RESEARCH 2013; 24 (1): 28-32

[2] MAÍRA BIANCHI RODRIGUES ALVESRUBENS PAES DE ARRUDA + MORE, LASERS IN MEDICAL SCIENCE, MAY 2016, VOLUME 31, ISSUE 4, PP 695-704

PAIN APPLICATION



THE EFFECT OF LOW-LEVEL LASER THERAPY ON KNEE OSTEOARTHRITIS

“Osteoarthritis (OA) is one of the most common joint disorders in the elderly which could be associated with considerable physical disability... In the current study, a significant reduction was observed regarding the nocturnal pain, pain on walking and ascending the steps, knee circumference, distance between the hip and heel, and knee to horizontal hip to heel distance at the end of the treatment course. In brief, the current study focuses on the fact that LLLT is effective in reducing pain in knee osteoarthritis.”

SOLEIMANPOUR, H., ET AL. (2014). “THE EFFECT OF LOW-LEVEL LASER THERAPY ON KNEE OSTEOARTHRITIS: PROSPECTIVE, DESCRIPTIVE STUDY.” LASERS MED SCI 29(5): 1695-1700.

PAIN APPLICATION



EFFECTS OF PHOTOBIOMODULATION THERAPY, PHARMACOLOGICAL THERAPY, AND PHYSICAL EXERCISE

“Osteoarthritis (OA) triggers increased levels of inflammatory markers, including prostaglandin (PG) E2 and proinflammatory cytokines. The elevation of cytokine levels is closely associated with increased articular tissue degeneration. Thus, the use of combination therapies may presumably be able to enhance the effects on the modulation of inflammatory markers. The present study aimed to evaluate and compare the effects of photobiomodulation therapy (PBMT), physical exercise, and topical nonsteroidal anti-inflammatory drug (NSAID) use on the inflammatory process after they were applied either alone or in different combinations. The results from the present study indicate that treatment with PBMT is more effective in modulating the inflammatory process underlying OA when compared with the other therapies tested.”

TOMAZONI, S. S., ET AL. (2017). “EFFECTS OF PHOTOBIOMODULATION THERAPY, PHARMACOLOGICAL THERAPY, AND PHYSICAL EXERCISE AS SINGLE AND/OR COMBINED TREATMENT ON THE INFLAMMATORY RESPONSE INDUCED BY EXPERIMENTAL OSTEOARTHRITIS.” LASERS MED SCI 32(1): 101-108.

PAIN APPLICATION



PHOTOBIOMODULATION THERAPY IN THE MODULATION OF INFLAMMATORY MEDIATORS AND BRADYKININ RECEPTORS IN AN EXPERIMENTAL MODEL OF ACUTE OSTEOARTHRITIS

“The objective of this study was to evaluate the effects of photobiomodulation therapy (PBMT) on inflammatory indicators, i.e., inflammatory mediators (TNF-alpha and CINC-1), and pain characterized by hyperalgesia and B1 and B2 receptor activation at 6, 24, and 48 h after papain-induced osteoarthritis (OA) in rats. We conclude that photobiomodulation therapy was able to promote the reduction of proinflammatory cytokines such as TNF-alpha and CINC-1, to reduce the gene and protein expression of the bradykinin receptor (B1 and B2), as well as increasing the stimulus response threshold of pressure in an experimental model of acute osteoarthritis.”

DE OLIVEIRA, V. L., ET AL. (2017). “PHOTOBIOMODULATION THERAPY IN THE MODULATION OF INFLAMMATORY MEDIATORS AND BRADYKININ RECEPTORS IN AN EXPERIMENTAL MODEL OF ACUTE OSTEOARTHRITIS.” LASERS MED SCI 32(1): 87-94.

NEUROPATHY APPLICATION



THE RESTORATIVE EFFECTS OF PULSED INFRARED LIGHT THERAPY ON SIGNIFICANT LOSS OF PERIPHERAL PROTECTIVE SENSATION

“Pulsed infrared light therapy (PILT) has been shown to increase peripheral sensation in diabetic patients with diabetic peripheral neuropathy (DPN). However, most studies last for very short periods, with the subjects receiving only 6-20 treatments. The purpose of this study was to evaluate the effectiveness of an eight-week course of PILT in reversing long-standing, profound DPN in patients with type 1 and type 2 diabetes. Changes in peripheral protective sensation (PPS) were measured using Semmes-Weinstein monofilaments (SWM) ranging from 3.7 to 6.48. PILT improved PPS even in patients with long-standing chronic neuropathies whose initial pre-study sensation was not measurable with a 200-g SWM. PILT significantly improves PPS. While the exact mechanism of action is not understood, infrared light may **improve peripheral neuropathies by improving foot perfusion by stimulating nitric oxide production.**”

ARNALL, D. A., ET AL. (2006). “THE RESTORATIVE EFFECTS OF PULSED INFRARED LIGHT THERAPY ON SIGNIFICANT LOSS OF PERIPHERAL PROTECTIVE SENSATION IN PATIENTS WITH LONG-TERM TYPE 1 AND TYPE 2 DIABETES MELLITUS.” ACTA DIABETOL 43(1): 26-33.

NEUROPATHY APPLICATION



EFFECTS OF MONOCHROMATIC INFRARED PHOTOTHERAPY IN PATIENTS WITH DIABETIC PERIPHERAL NEUROPATHY

“Monochromatic infrared energy (MIRE) or phototherapy has been used to improve plantar sensitivity and pain in lower limbs of patients with diabetic sensorimotor peripheral neuropathy (DSPN), but the available primary results are inconsistent. There was limited evidence that MIRE results in short-term improvement of tactile sensitivity probably not sustained over time. Limited evidence also suggested that MIRE does not provide relief for neuropathic pain. As quality of evidence is low, further studies are likely to change the estimated effect.”

ROBINSON, C. C., ET AL. (2017). “EFFECTS OF MONOCHROMATIC INFRARED PHOTOTHERAPY IN PATIENTS WITH DIABETIC PERIPHERAL NEUROPATHY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS.” BRAZ J PHYS THER 21(4): 233-243.

BEAUTY APPLICATION



830 NM LIGHT-EMITTING DIODE LOW LEVEL LIGHT THERAPY (LED-LLLT) ENHANCES WOUND HEALING: A PRELIMINARY STUDY

“The application of light-emitting diodes in a number of clinical fields is expanding rapidly since the development in the late 1990s of the NASA LED. Wound healing is one field where low level light therapy with LEDs (LED-LLLT) has attracted attention for both accelerating wound healing and controlling sequelae. The present study evaluated LED-LLLT in 5 wounds of various etiologies. All patients were in varying degrees of pain. All wounds were treated with multiple sessions (daily, every other day or twice weekly) using an LED-LLLT system (830 nm, CW, irradiance of 100 mW/cm² and fluence of 60 J/cm²) till improvement was achieved... Full wound healing and control of infection and discomfort were achieved in all patients, with wound condition-mediated treatment periods ranging from 1 to 8 weeks... 830 nm LED-LLLT successfully brought about accelerated healing in wounds of different etiologies and at different stages, and successfully controlled secondary infection. LED-LLLT was easy and pain-free to apply, and was well-tolerated by all patients. The good results warrant the design of controlled studies with a larger patient population.”

MIN, P. K. AND B. L. GOO (2013). "830 NM LIGHT-EMITTING DIODE LOW LEVEL LIGHT THERAPY (LED-LLLT) ENHANCES WOUND HEALING: A PRELIMINARY STUDY." LASER THER 22(1): 43-49.

BEAUTY APPLICATION



LIGHT-EMITTING DIODE FOR ACNE, SCARS, AND PHOTODAMAGED SKIN

“Light-emitting diode therapy was discovered in the late 1960s but only recently has it been widely applied in dermatology to treat a wide range of skin diseases including photoaging, scars, and acne. Since the introduction of photobiostimulation into medicine, the effectiveness and applicability of a variety of light sources have thoroughly been investigated. Light-emitting diode photomodulation is a nonthermal technology used to modulate cellular activity with light, and the photons are absorbed by mitochondrial chromophores in skin cells. Various beneficial effects of light-emitting diode at relatively low intensities have been reported, especially in indications where stimulation of healing, reduction of pain and inflammation, restoration of function, and skin rejuvenation are required. The light-emitting diode therapy is safe, nontoxic, and noninvasive with no side effects reported in the published literature.”

PITASSI, L. (2016). “LIGHT-EMITTING DIODE FOR ACNE, SCARS, AND PHOTODAMAGED SKIN.” CLINICAL APPROACHES AND PROCEDURES IN COSMETIC DERMATOLOGY.

BEAUTY APPLICATION



BLUE LIGHT FOR INFECTIOUS DISEASES: PROPIONIBACTERIUM ACNES, HELICOBACTER PYLORI, AND BEYOND

“Blue light, particularly in the wavelength range of 405-470 nm, has attracted increasing attention due to its intrinsic antimicrobial effect without the addition of exogenous photosensitizers. In addition, it is commonly accepted that blue light is much less detrimental to mammalian cells than ultraviolet irradiation, which is another light-based antimicrobial approach being investigated. In this review, we discussed the blue light sensing systems in microbial cells, antimicrobial efficacy of blue light, the mechanism of antimicrobial effect of blue light, the effects of blue light on mammalian cells, and the effects of blue light on wound healing. It has been reported that blue light can regulate multi-cellular behavior involving cell-to-cell communication via blue light receptors in bacteria, and inhibit biofilm formation and subsequently potentiate light inactivation. At higher radiant exposures, blue light exhibits a broad-spectrum antimicrobial effect against both Gram-positive and Gram-negative bacteria. Blue light therapy is a clinically accepted approach for Propionibacterium acnes infections. Clinical trials have also been conducted to investigate the use of blue light for Helicobacter pylori stomach infections and have shown promising results...”

HEALTH & WELLNESS APPLICATION



LIGHT-EMITTING DIODE THERAPY (LEDT) IMPROVES FUNCTIONAL CAPACITY IN RATS WITH HEART FAILURE

“The syndrome of heart failure (HF) promotes central and peripheral dysfunctions that result in functional capacity decrease, leading to fatigue, dyspnea, and exercise intolerance. The use of light-emitting diode therapy (LEDT) has shown good results reducing fatigue and exercise intolerance, when applied on skeletal muscles before or after exercises. Comparing the percentage difference (Delta) between baseline and the final ET, there was no significant difference for the VO₂max variable considering all groups. However, Sham and LEDT-HF groups showed higher relative values than the Control-HF group, respectively, for distance covered (27.7 and 32.5 %), time of exercise test (17.7 and 20.5 %), and speed (13.6 and 12.2 %). In conclusion, LEDT was able to increase the functional capacity evaluated by distance covered, time, and speed of exercise in rats with HF.”

CAPALONGA, L., ET AL. (2016). “LIGHT-EMITTING DIODE THERAPY (LEDT) IMPROVES FUNCTIONAL CAPACITY IN RATS WITH HEART FAILURE.” LASERS MED SCI 31(5): 937-944.

HEALTH & WELLNESS APPLICATION



ROLE OF LOW-LEVEL LASER THERAPY IN NEUROREHABILITATION

“This year marks the 50th anniversary of the discovery of the laser. The development of lasers for medical use, which became known as low-level laser therapy (LLLT) or photobiomodulation, followed in 1967. In recent years, LLLT has become an increasingly mainstream modality, especially in the areas of physical medicine and rehabilitation. At first used mainly for wound healing and pain relief, the medical applications of LLLT have broadened to include diseases such as stroke, myocardial infarction, and degenerative or traumatic brain disorders. This review will cover the mechanisms of LLLT that operate both on a cellular and a tissue level. Animal studies and human clinical trials of LLLT for indications with relevance to neurology, such as stroke, traumatic brain injury, degenerative brain disease, spinal cord injury, and peripheral nerve regeneration, will be covered.”

HASHMI, J. T., ET AL. (2010). “ROLE OF LOW-LEVEL LASER THERAPY IN NEUROREHABILITATION.” PM R 2(12 SUPPL 2): S292-305.

HEALTH & WELLNESS APPLICATION



COGNITIVE ENHANCEMENT BY TRANSCRANIAL LASER STIMULATION AND ACUTE AEROBIC EXERCISE

“This is the first randomized, controlled study comparing the cognitive effects of transcranial laser stimulation and acute aerobic exercise on the same cognitive tasks. We examined whether transcranial infrared laser stimulation of the prefrontal cortex, acute high-intensity aerobic exercise, or the combination may enhance performance in sustained attention and working memory tasks. The transcranial infrared laser stimulation and acute aerobic exercise treatments were similarly effective for cognitive enhancement, suggesting that they augment prefrontal cognitive functions similarly.”

HWANG, J., ET AL. (2016). “COGNITIVE ENHANCEMENT BY TRANSCRANIAL LASER STIMULATION AND ACUTE AEROBIC EXERCISE.” LASERS MED SCI 31(6): 1151-1160.

HEALTH & WELLNESS APPLICATION



SHINING LIGHT ON THE HEAD: PHOTOBIMODULATION FOR BRAIN DISORDERS

“Photobiomodulation (PBM) describes the use of red or near-infrared light to stimulate, heal, regenerate, and protect tissue that has either been injured, is degenerating, or else is at risk of dying. One of the organ systems of the human body that is most necessary to life, and whose optimum functioning is most worried about by humankind in general, is the brain. The brain suffers from many different disorders that can be classified into three broad groupings: traumatic events (stroke, traumatic brain injury, and global ischemia), degenerative diseases (dementia, Alzheimer’s and Parkinson’s), and psychiatric disorders (depression, anxiety, post traumatic stress disorder). There is some evidence that all these seemingly diverse conditions can be beneficially affected by applying light to the head. There is even the possibility that PBM could be used for cognitive enhancement in normal healthy people.”

HAMBLIN, M. R. (2016). “SHINING LIGHT ON THE HEAD: PHOTOBIMODULATION FOR BRAIN DISORDERS.” BBA CLIN 6: 113-124.

SPORT APPLICATION



SHINING LIGHT ON THE HEAD: PHOTOBIOMODULATION FOR BRAIN DISORDERS

“The use of low level laser (light) therapy (LLLT) has recently expanded to cover areas of medicine that were not previously thought of as the usual applications such as wound healing and inflammatory orthopedic conditions. One of these novel application areas is LLLT for muscle fatigue and muscle injury. Since it is becoming agreed that mitochondria are the principal photoacceptors present inside cells, and it is known that muscle cells are exceptionally rich in mitochondria, this suggests that LLLT should be highly beneficial in muscle injuries. The ability of LLLT to stimulate stem cells and progenitor cells means that muscle satellite cells may respond well to LLLT and help muscle repair. Furthermore the ability of LLLT to reduce inflammation and lessen oxidative stress is also beneficial in cases of muscle fatigue and injury.”

FERRARESI, C., ET AL. (2012). “LOW-LEVEL LASER (LIGHT) THERAPY (LLLT) ON MUSCLE TISSUE: PERFORMANCE, FATIGUE AND REPAIR BENEFITED BY THE POWER OF LIGHT.” PHOTONICS LASERS MED. 1(4): 267-286.

SPORT APPLICATION



LIGHT-EMITTING DIODE THERAPY IN EXERCISE-TRAINED MICE INCREASES MUSCLE PERFORMANCE, CYTOCHROME OXIDASE ACTIVITY, ATP AND CELL PROLIFERATION

“Light-emitting diode therapy (LEDT) applied over the leg, gluteus and lower-back muscles of mice using a LED cluster (630 nm and 850 nm, 80 mW/cm² , 7.2 J/cm²) increased muscle performance (repetitive climbing of a ladder carrying a water-filled tube attached to the tail), ATP and mitochondrial metabolism; oxidative stress and proliferative myocyte markers in mice subjected to acute and progressive strength training. Six bi-daily training sessions LEDT-After and LEDT-Before-After regimens more than doubled muscle performance and increased ATP more than tenfold. The effectiveness of LEDT on improving muscle performance and recovery suggest applicability for high performance sports and in training programs. Positioning of the mice and light-emitting diode therapy (LEDT) applied on mouse legs, gluteus and lower-back muscles without contact.”

FERRARESI, C., ET AL. (2015). “LIGHT-EMITTING DIODE THERAPY IN EXERCISE-TRAINED MICE INCREASES MUSCLE PERFORMANCE, CYTOCHROME C OXIDASE ACTIVITY, ATP AND CELL PROLIFERATION.” J BIOPHOTONICS 8(9): 740-754.

SPORT APPLICATION



LONG-TERM LOW-LEVEL LASER THERAPY PROMOTES AN INCREASE IN MAXIMAL OXYGEN UPTAKE AND EXERCISE PERFORMANCE IN A DOSE-DEPENDENT MANNER IN WISTAR RATS

“The use of low-level laser therapy (LLLT) represents a new intervention modality that has been explored to enhance exercise performance. The aim of this study was to evaluate the influence of LLLT (GaAlAs-850 nm) at different doses on VO₂max and on exercise performance in rats... No significant results were found comparing before and after conditions for the studied variables considering P-LLLT and 8.7 J/cm(2)-LLLT groups. The LLLT promoted in a dose-dependent manner an increase in oxygen consumption uptake and a performance increment of male Wistar rats.”

PERINI, J. L., ET AL. (2016). “LONG-TERM LOW-LEVEL LASER THERAPY PROMOTES AN INCREASE IN MAXIMAL OXYGEN UPTAKE AND EXERCISE PERFORMANCE IN A DOSE-DEPENDENT MANNER IN WISTAR RATS.” LASERS MED SCI 31(2): 241-248.

DEPTH OF PENETRATION & ABSORPTION OF LIGHT ENERGY PHOTONS IN HUMAN TISSUE:

- Visible Color Light Photons (Non-thermal, 400nm-720nm)
- Invisible Near-Infrared (Nearly Non-thermal, 730nm-1500nm)

