PHOTOBIOMODULATION (PBM) THERAPY
A proven way to regenerate tissue at the cellular level

PHOTOBIOMODULATION (PBM) is a form of light therapy based on the photobiological effects of light on cells. It is a form of light therapy that uses low levels of light to promote tissue healing and regeneration. PBM therapy is based on the photochemical process called photobiomodulation (PBM). In photobiomodulation therapy, a light source is placed near or in contact with the skin, the light energy penetrates the skin reaching the mitochondria of damaged or diseased tissue. The primary target of photobiomodulation therapy is the mitochondria of the cell. Photobiomodulation therapy (PBMT) is a form of light therapy based on the photobiological effects of light on cells. It is a form of light therapy that uses low levels of light to promote tissue healing and regeneration. PBM therapy is based on the photochemical process called photobiomodulation (PBM). In photobiomodulation therapy, a light source is placed near or in contact with the skin, the light energy penetrates the skin reaching the mitochondria of damaged or diseased tissue. The primary target of photobiomodulation therapy is the mitochondria of the cell.

PBM Mechanisms of Action

The application of a therapeutic dose of light to improved or dysfunctional tissue leads to a cellular response mediated by mitochondrial mechanisms that reduce pain and inflammation and speed healing.1-4

The primary target (chromophore) for the process is the cytochrome complex which is found in the inner membrane of the cell mitochondria. Cytochrome c is a vital component of the electron transport chain that drives cellular metabolism. As light is absorbed, cytochrome c is stimulated, leading to increased production of adenosine triphosphate (ATP), the molecule that facilitates energy transfer within the cell.2-4

In addition to ATP, laser stimulation also produces free radical reactive oxygen and reactive nitrogen species. Nitric oxide is a powerful vasodilator and an important cellular signaling molecule involved in many physiological processes. Reactive oxygen species have been shown to affect many important physiological signaling pathways including the inflammatory response. In concert, these molecules have been shown to increase in the cell proliferation and motility leads to extracellular matrix deposition. The resultant increase growth factor production and promote pro-survival pathways for the cell.2-4

The Benefits of the Massage Ball

Maximize clinical results with the benefits of LightForce’s patented, on-contact photobiomodulation therapy treatment application.

PHYSIOLOGICAL EFFECTS

- Anti-inflammatory action, analgesic, and anti-edematous action
- Increased tissue oxygenation and nutrition
- Increased synthesis of ATP
- Increased regulation of tissue regeneration
- Increased microcirculation

Use photobiomodulation therapy in conjunction with other modalities and treatment techniques with no side-effects.

- Acute conditions
- Chronic conditions

Multiple Tissues:

- Nerves
- Tendons
- Ligaments
- And More

APPLICATIONS & DELIVERY

Versatile applications, maximum results

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PBM Dosing - The Key To Results

Doseometry in photobiomodulation (PBM) therapy is highly complicated - no single “dose” will work for all possible PBM therapies, and in some cases, different dosimetries can be equally effective. Safe and effective PBM doses must consider multiple treatment parameters including wavelength, irradiance (often called power density or brightness), pulse structure, and irradiation time.4

Furthermore, it is important to recognize that PBM is challenged by energy loss that occurs as light enters the skin and travels from superficial to deeper tissues. At the skin’s surface this is primarily due to reflection and below the surface by absorption from different tissues competing for different wavelengths of light. Proper configuration of the laser is a key factor in getting sufficient energy to target tissues.

Factors that Impact Dose Delivery at Depth

- Wavelength
- Irradiance (power & beam area)
- Mechanism of delivery (contact vs. non-contact)
- Treatment time
- Size of treatment area
- Type of issue

Laser Classes - What Do They Mean?

Laser are classified by the FDA according to their output power. In the field of photobiomodulation therapy, there are two common laser classifications:

- Class IIIb: Maximum power output of 0.5 watts.
- Class IV: Maximum power output of over 0.5 watts.

Both Class IIIb and Class IV lasers require that safety eye protection be worn during treatment.

For example, to effectively treat a 300 cm2 thoracic spine at 10 J/cm2, 3,000 joules of energy are required (surface of the skin to deliver a therapeutic dose at depth. How long would that treatments require? For a Class IIIb laser vs. a Class IV laser?)

Power is a key factor when defining a therapeutic dose to deep target tissues. Not only do LightForce lasers have higher output powers, but they also have larger beam areas, making them more capable of delivering a therapeutic dose to larger treatment areas.

The Impact of Power on Treatment Times

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What’s in a Name?
The evolution of PBM Therapy

“Cold Laser”, “Low-Level Laser Therapy (LLLT)”, what do these terms mean? In general, such terms refer to “treatment using irradiation with light of low power intensity so that the effects are a response to the light and not due to heat.” Many of the terms used to commonly describe this process do not clearly reflect the mechanisms involved. They also don’t adequately distinguish this therapy from other laser-based therapies that rely on heating tissue to achieve an effect. This lack of clarity has led to significant confusion about the modality and a need for better nomenclature.1

In September 2014, the North American Association for Light Therapy (NAALT) and the World Association for Laser Therapy (WALT) convened and agreed upon the term “Photobiomodulation Therapy” as the preferred nomenclature for this modality. The term was added to the MeSH database in November 2015 and is the preferred name for researchers and key opinion leaders in the field because it more clearly characterizes the modality.2

References