**PHOTOBIOMODULATION (PBM) THERAPY**

A proven way to regenerate tissue at the cellular level.

**APPLICATIONS & DELIVERY**

Versatile applications, maximum results.

**PHOTOBIOMODULATION DOSING**

A drug-free, surgery-free, non-invasive pain solution.

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**PHOTOBIO MODULATION (PBM) THERAPY**

A form of light therapy 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 leading to photobiomodulation. The process results in beneficial therapeutic outcomes such as the alleviation of pain, the regulation of inflammation, immunomodulation, and the promotion of tissue regeneration.1-4

**PBM Mechanisms of Action**

The application of a therapeutic dose of light to impaired or dysfunctional tissue leads to a cellular response mediated by mitochondrial mechanisms that reduce pain and inflammation and speed healing.5 The primary target (chromophore) for the process is the cytochrome c complex which is found in the inner membrane of the cell mitochondria. Cytochrome c is a subunit of the electron transport chain that drives cellular metabolism. As light is absorbed, cytochrome c is stimulated, producing increased production of adenosine triphosphate (ATP), the molecule that facilitates energy transfer within the cell.6-8

In addition to ATP, laser stimulation also produces free nitric oxide (NO) and reactive oxygen species (ROS). 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 act as pro-survival pathways for the cell.2-4

**PBM Benefits**

- Increased tissue oxygenation and nutrition
- Anti-inflammatory, analgesic, and anti-edematous (CA2+, K+), ATP
- Increased synthesis of ATP (HIF-1, AP-1)

**PHYSIOLOGICAL EFFECTS**

- Anti-inflammatory, anti-edematous, and anti-oxidative
- Increased synthesis of ATP
- Increased rate of tissue regeneration
- Increased microcirculation

**Factors that Impact Dose**

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

**The Impact of Power on Treatment Times**

Proper configuration of the laser is a key factor in getting sufficient energy to target tissues. Power is a key factor when defining a therapeutic dose to deep target tissues because of the irradiance (brightness) required to produce a clinical effect. Not only do Companion lasers have the capability to deliver a therapeutic dose to deep target tissues, but they also have the capability to deliver the irradiance required to produce a clinical effect.

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**PBM Dosing - The Key To Results**

Dosimetry in photobiomodulation (PBM) therapy is highly complicated - no angle “dose” will work for all possible PBM therapies, and in some cases, different dosimetry can be equally effective. Safe and effective PBM therapy must consider multiple treatment parameters including: wavelength, irradiance (often called power density or brightness), tissue type being treated (including pigmentation of patient’s skin and coat), 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 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.

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**Laser Classes - What Do They Mean?**

Lasers 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 emission.

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**The Benefits of the Deep Tissue Applicator**

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

**Improve Recovery For...**

- Chronic conditions
- Acute conditions
- Muscles
- Nerves
- Joints
- Tendons & Ligaments
- Skin
- And More

**DIRECT TREATMENT**

- Compress
- Calibrate
- Reflect

**Soft Tissue Work**

- Allows you to do manual soft tissue work with the deep tissue applicator while delivering energy.

**REFRACTIVE INDEX**

- The fused silica composition of the deep tissue applicator minimizes light losses as it passes from the applicator into the skin due to similar refractive indices.

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**The Impact of Power on Treatment Times**

For example, to effectively treat a 300 cm² wound (8 in x 12 in) with a 635 nm diode laser at 200 mW of power requires twice the power from a 980 nm fiber laser. To deliver a therapeutic dose to larger treatment areas.

**Class IIIb**

- 3,000 J at 0.5 W = 3 mA

**Class IV**

- 3,000 J at 15 W = 33 mA
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.

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.

References