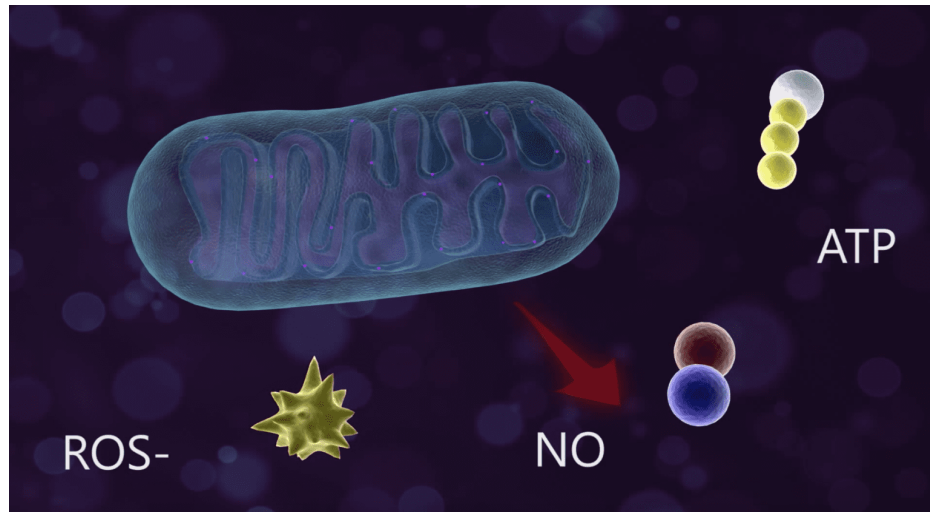




THE SCIENCE BEHIND HOW LASER THERAPY WORKS

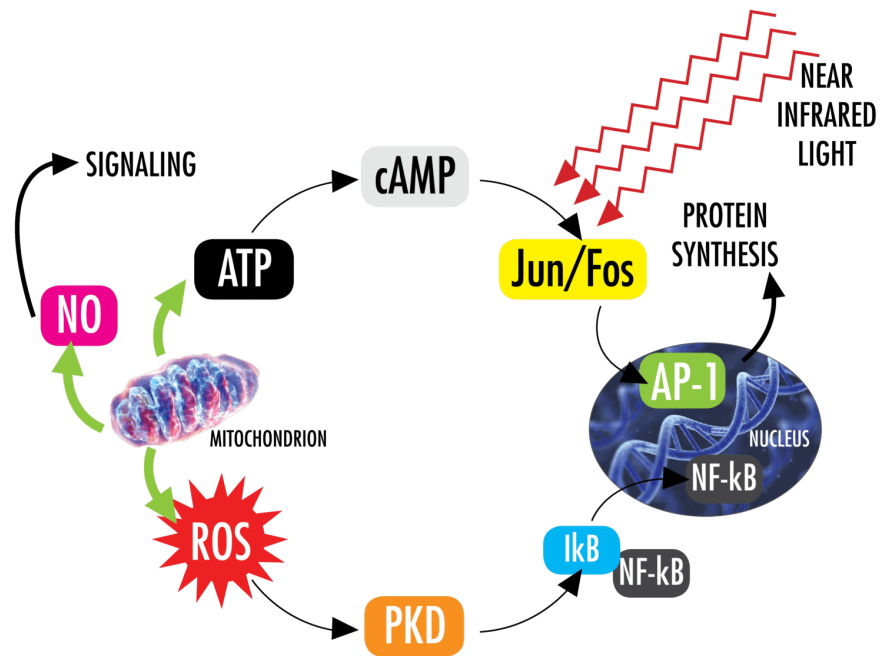
HOW DOES LASER THERAPY WORK?



Laser therapy is a medical treatment that uses focused light to stimulate a process called **photobiomodulation** (PBM means photobiomodulation). During PBM, photons enter the tissue and interact with the cytochrome c complex within mitochondria. This interaction triggers a biological cascade of events that leads to an increase in cellular metabolism, which can **decrease pain** as well as accelerate the healing process.

The fundamental principles that underpin photobiomodulation (PBM) therapy, as currently understood in the scientific literature, are relatively straightforward. There is consensus that the application of a therapeutic dose of light to impaired or dysfunctional tissue leads to a cellular response mediated by mitochondrial mechanisms. Studies have shown that these changes can impact pain and inflammation, as well as, tissue repair.

PHOTOBIOMODULATION PROCESS



Stimulate Cytochrome C

The primary target for the photobiomodulation process is the Cytochrome C 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.

Increase Production of ATP (Energy)

As light is absorbed by Cytochrome C oxidase (COX), it stimulates the electron transport chain to increase the production of adenosine triphosphate (ATP) within the mitochondria. When tissue is damaged, the production of ATP in the cell is impaired which slows down the metabolism of the cell as a protective mechanism. PBM helps restore the oxidative process which helps restore normal cellular function.

Increase NO and ROS Activity

In addition to ATP, laser stimulation also produces free nitric oxide (NO) and modulates reactive oxygen species (ROS). NO is a powerful vasodilator and an important cellular signaling molecule involved in many physiological processes. ROS have been shown to affect many important physiological signaling pathways including the inflammatory response. Together, increased NO and improved ROS levels provide an environment for faster signaling, resulting in decreased inflammation.

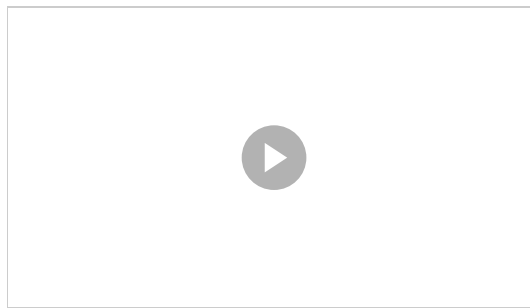
Restore Cellular Energy Balance

PBM helps restore normal cellular function which helps prevent apoptosis (cell death). This helps reduce inflammation, edema, and hastens the tissue repair process.

REACHING TARGET TISSUE

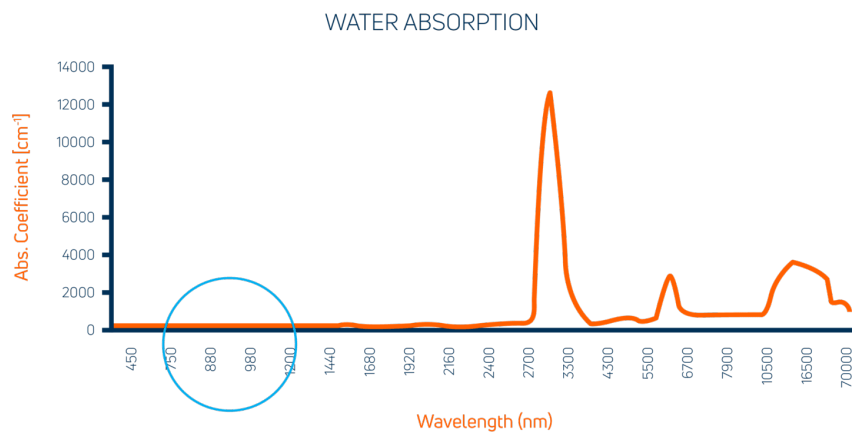
For PBM to occur, light needs to reach the mitochondria of the damaged target tissue. When laser therapy is applied to the surface of the skin the best results are achieved when a sufficient amount of light (number of photons) reaches the target tissue. There are a number of factors that can help maximize the light that reaches the target tissue, including:

- Light Wavelength
- Minimizing Unwanted Absorption
- Power
- Reducing Reflections



WHAT WAVELENGTHS OF LIGHT ARE THE BEST FOR PHOTOBIOMODULATION (PBM)?

As opposed to white light, which contains a broad range of wavelengths, laser light is monochromatic which means it contains one wavelength. The unit used to measure wavelength is a nanometer (nm). Much research has been done to investigate how melanin, blood, fat and water absorb light, and this has led researchers to define a window or range of wavelengths through which light can penetrate biological tissue. This window is referred to as the optical or therapeutic window.



This graph shows water absorption on a linear scale. [LightForce® lasers](#) utilize both 810 and 980 nm wavelengths due to their ability to be preferentially absorbed by musculoskeletal tissues. These wavelengths also minimize the interference of melanin which has an affinity for shorter wavelengths as well as the impact of water within the body which preferentially absorbs longer wavelengths. Energy that is absorbed by melanin or water in the body is energy that is lost at the target tissue.

POWER

LASERS FOR LIFE®

Grounded in scientific evidence. Forged through innovation. Proven by results.

therapy lasers <499 mW), and Class IV (all lasers ≥500 mW). In December 2003, the FDA approved the first Class IV laser for the relief of minor muscle and joint pain. In October 2006, LiteCure, LightForce®'s parent company, was formed and FDA clearance for the LCT-1000, a Class IV medical therapy laser, was granted in February 2007. LightForce® has been providing Class IV lasers for the US market, and growing global market, ever since.

LightForce® lasers not only have the ability to deliver higher power for various conditions, but they also incorporate delivery systems that can efficiently treat tissue in a way that is comfortable to the patient. Simply stated, injured tissue requires threshold levels of light (photons) to be delivered in order to have a therapeutic effect. Hundreds of scientific studies on photobiomodulation therapy have been done in vivo and have characterized the dosages needed to achieve a cellular response to light. The required levels of energy needed to impact tissue during in vivo studies is significantly higher due to the loss of energy that takes place as light travels through tissue. Examples of these losses include the impact of melanin in the skin, extra cellular water, and other molecules in the plasma that might absorb photonic energy. LightForce® has participated in multiple double-blind photobiomodulation therapy studies in order to help quantify these differences and deliver protocols that are safe and effective.

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Applied to the palm of

5 watts, and 10 watts

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What is Laser Therapy?

enter the power, the
Science Behind Laser Therapy
the number of

photons that will be
delivered to deeper tissues

photobiomodulation
by. With the higher

power lasers, it is possible to
not only apply the benefits

superficially, but it is
also possible to treat a

greatly expanded range of
conditions by delivering a

clinically effective quantity
of photons to cells deep

within tissue.

Learn more about [how power impacts photobiomodulation therapy](#). >

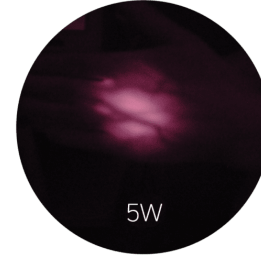
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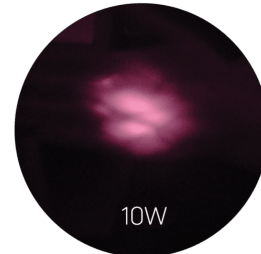
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