Treatment with ENERGY-LASER PRO™

Model: L500 PRO – 500 mW / 808 nm

Model: L800 PRO – 4 x 200 mW / 660 nm

Model: L2000 PRO – 4 x 500 mW / 808 nm

Low Level Laser Therapy – LLLT

PhotoBioModulation – PBM

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Laser therapy for wounds, inflammation, and pain

ENERGY-LASER PRO™ is developed and designed for the professional clinicians for clinic use, for example with chiropractors, physiotherapists, wound clinics, and others.

<u>Indications for laser treatment includes:</u>

- Musculoskeletal disorders (Pain intensity)
- Chronic nonspecific low back pain (Pain reduction)
- Shoulder tendinopathy (pain relief)
- Knee osteoarthritis (pain reduction)
- Temporomandibular myofascial pain (pain intensity)
- Fixed orthodontic therapy (pain reduction)
- Complication after mandibular third molar surgery (pain reduction)
- Recurrent aphthous stomatitis (pain and wound healing)

DID YOU KNOW?
The word "LASER" is an acronym for "Light Amplification by Stimulated Emission of Radiation."
Lasers for therapeutic use are called Low Level Laser Therapy (LLLT) or PhotoBioModulation (PBM).

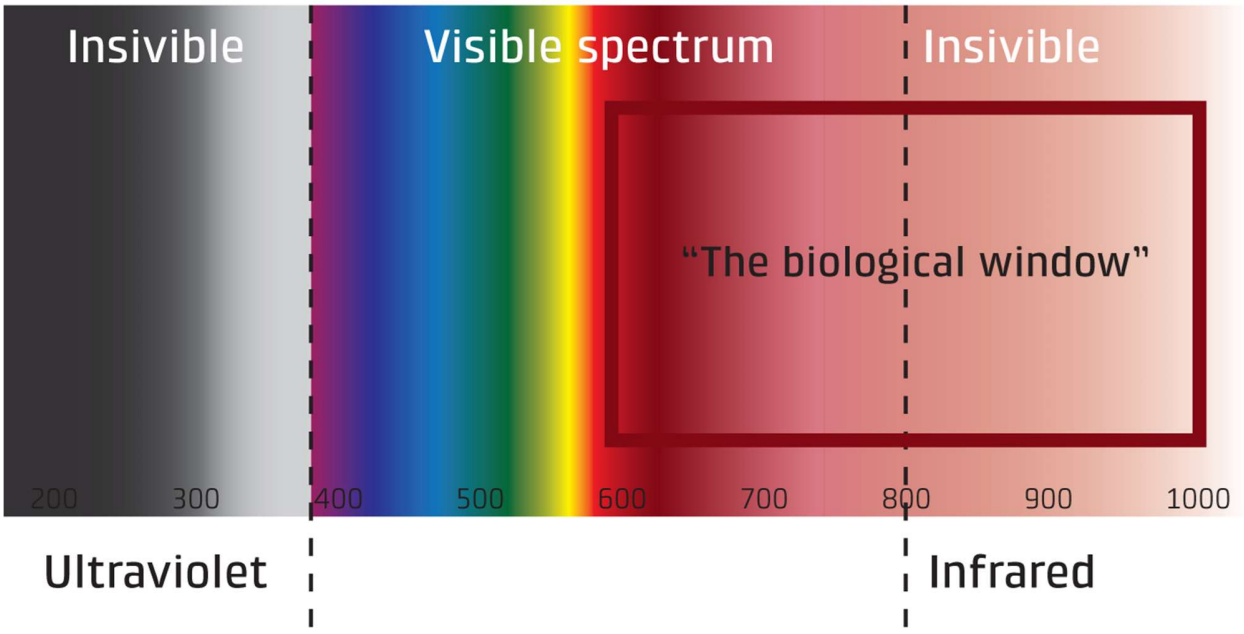
Laser Light for Therapeutic use

For more than 40 years lasers have been used to treat various ailments. This has now led to what is known today as **Low Level Laser Therapy (LLLT)** or **PhotoBioModulation (PBM)**. The mechanism behind LLLT is the laser's ability to transfer energy to the cells without the risk of overheating the tissue which may result in tissue damage or injury.
Today, the most commonly used lasers for this purpose use energy levels at 500 mW.

Laser Light versus Visible Light
The electromagnetic spectrum is way of categorizing electromagnetic energy by their physical properties**: frequency, wavelength, or photon energy**. Electromagnetic energy in general can be described as photons moving in waves. The spectrum includes, but is not limited to, the visible and invisible laser light, which will be discussed more detail below.

The distance between two wave peaks is denoted as the wavelength (nm). This property determines if and how the human eye perceives it i.e., what color the light is viewed as.
The visible part of the spectrum ranges from **380 nm to 670 nm.**

The same principle regarding wavelength applies to laser light: The wavelength of the light emitted from the laser is measured in nm (nanometers) whilst the energy is measured in Joules or Watts (1 W = 1 J/s).



Lasers for therapeutic operate within what is known as the biological window which includes both the invisible and visible part of the spectrum. Laser energy with a wavelength above 670 nm is invisible to the human, whilst lasers with a wavelength below this threshold is seen as red light.

The laser works like a light gun that fires energy in the form of 'photons' at a very specific wavelength. This is then amplified numerous times and projected through an optical lens that focuses the beam of light. This enables a large amount of energy to be delivered to a small and specific area.

The crucial difference between laser light and other types of light is that the light emitted by the laser is ***coherent***. In other words, the light emitted is limited to a very narrow spectrum e.g., a single wavelength like 808nm. This contrasts with other types of light that are **'incoherent'** and they are released as heat, while energy from laser light will not be released until it contacts a surface where energy can then be absorbed.

Laser Class
Lasers in class 3B, if used according to the instructions provided in the *user manual*, are completely harmless and safe to use in the trained hands of a clinician.

Treatment Using Laser light

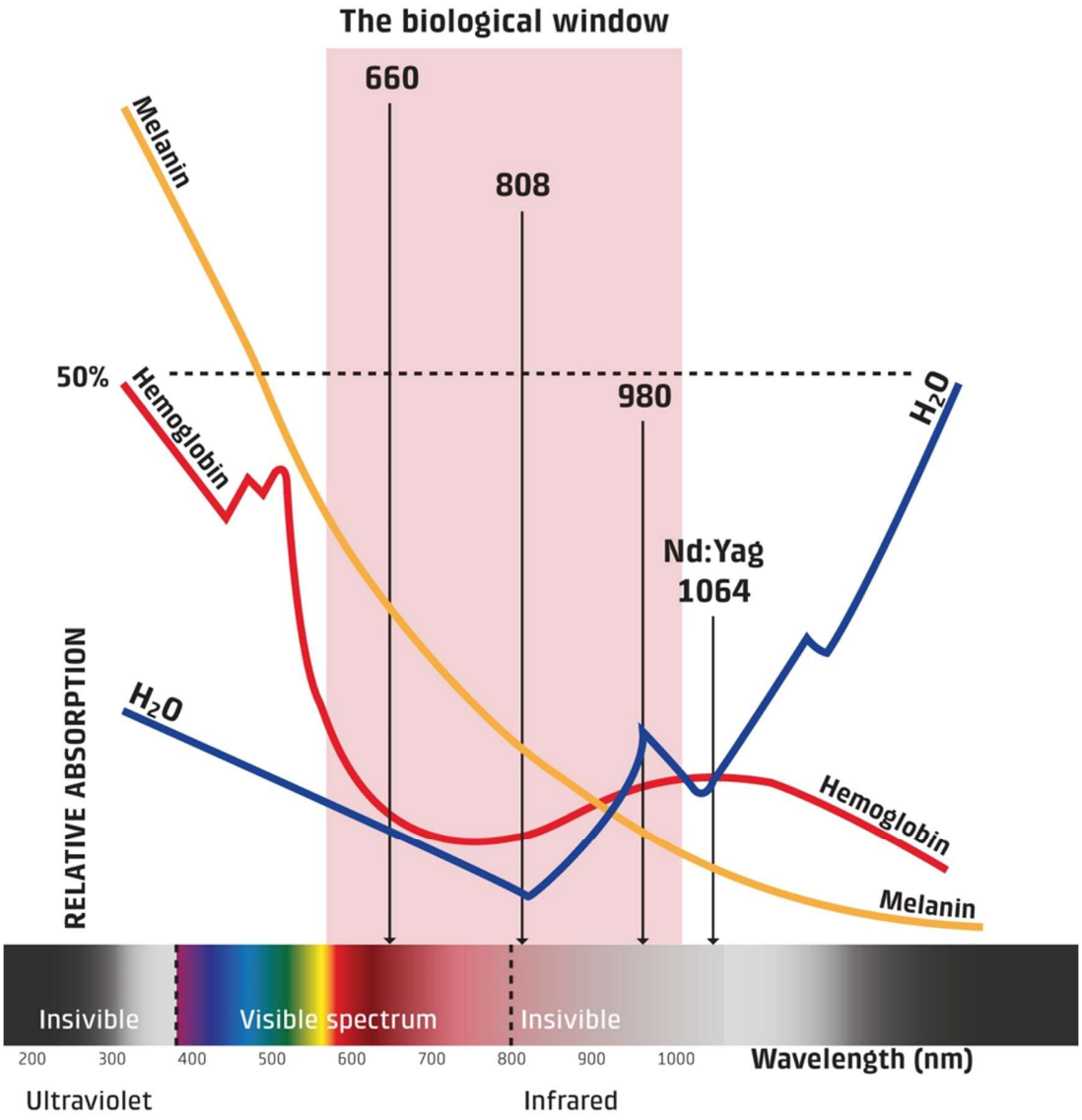
When using lasers therapeutically, the energy delivered to 1 cm^2 skin should never exceed 500 mW. If this threshold is exceeded the laser energy will be converted into heat in the tissue being treated. The energy will be deposited in the tissues containing pigment, for example in the skin, hair and blood vessels, possibly resulting in tissue damage.

Lasers delivering energy levels greater than 500 mW per 1 cm^2 should always be used in conjunction with specific lens optics that diverges the energy evenly.

An example of this could be a laser with an energy rating of 5000 mW. The laser beam would have to be spread over an area of approximately 10 cm^2 so as to avoid unwanted damage to the skin and underlying tissue. If a large amount of energy is required for the treatment it is possible to use multiple lasers. By using multiple lasers to treat different areas it is possible to deliver a large amount of energy whilst adhering to the safety precautions.

An alternative solution is an integrated laser system built to treat a large area all at once. The system can consist of multiple laser all working together, but each laser treats its own separate area. None of the lasers should exceed an energy rating of 500 mW so to avoid overheating and damaging the tissue.

The Biological Window



Laser light ranging from around 600 nm (visible spectrum) to 1000 nm (infrared, invisible spectrum) is referred to as **the "Biological Window".**

Laser light in this particular range is able to penetrate the skin and permeate underlying tissue, thereby reach and treat the cells. The depth the laser energy is able to reach is dependent on the wavelength. Lasers with a wavelength of 600-700 nm affect more shallow targets (1-2 cm), and therefore used to treat superficial tissue (skin, wounds). Lasers with a wavelength of 800-900 nm treat deeper tissue (3-4 cm) and are used primarily for pain and tissue therapy.

Laser light with a wavelength below 600 nm or above 1000 nm are unable to penetrate the skin, and such wavelengths cannot be used. This is because these wavelengths will be blocked by natural pigment found in skin, hair, blood and water molecules instead of reaching the intended target.

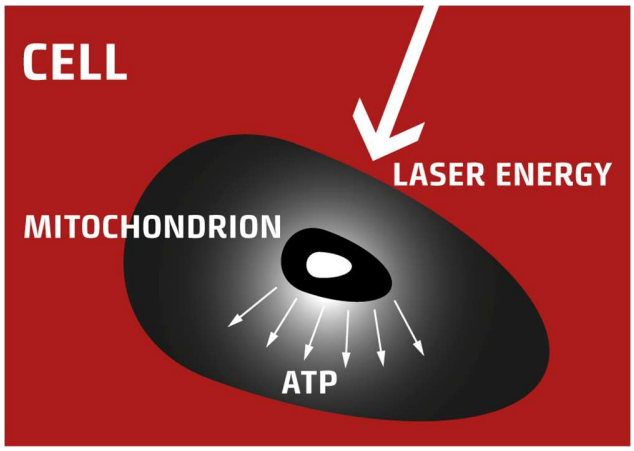
The Unique Properties of Laser Energy

What Makes Laser Energy Special?
Laser energy is a part of the electromagnetic spectrum which is the spectrum on which all types of light exist, and we can categorize it. This makes laser energy related to other electromedical devices and therapy forms using waves in the form of light and sound e.g., x-rays (light waves) and ultrasound scans (sound waves).

Laser energy is electromagnetic and thus can be thought of as energy in the form of invisible light. The laser light has the unique ability to affect cells both structurally and functionally which is a noteworthy property to be able to harness.

Transfer of energy
Treatment with laser works through the delivery of energy to the cells in the tissue requiring treatment. The energy emitted by the laser penetrates the skin and triggers cell activity. This increased activity improves cell function, strengthens the immune system, and increases blood circulation. The positive effects of laser treatment on the body's immune system, as well as its ability to accelerate the healing process, makes it an incredibly therapeutic tool. The mechanism and science supporting 'laser therapy efficacy' makes it a valuable treatment tool in all clinical areas.

The Biological Effect of Laser Light
The photons deposited through laser light have the ability to accelerate cell proliferation and the healing processes. The following is a basic explanation of cellular respiration and how lasers affect this process. In this process dietary sugars are transformed into ATP (Adenosine Tri Phosphate) which is a molecule in our Mitochondria, that the cells can use to produce energy.
The laser energy also stimulates the surrounding substances, such as flavins and cytochromes, which all play an important part in cellular respiration. The energy generated is converted to free oxygen which induces cellular respiration and thus increases ATP production in the Mitochondria. The ATP production then activates the formation of DNA and RNA. Many other steps are included in this process, but the end result is an increase in cell division. The effect of LLLT/PBM in essence is that the energy deposited is used directly in the cells. This allows the cells to start cellular respiration.



Effects of laser light
There are numerous positive effects associated with laser light. The tissue treated with the laser will have an increased blood flow through the treated and dilated blood vessels, increased oxygenation of the surrounding tissue, increased synthesis of fibroblasts, accelerated synthesis of collagen connective tissue as well as formation of granulated tissue in deep wounds such as deep leg ulcers and Pilonidal sinus wounds. This ultimately results in a reduction of inflammation as well as the production of new skin and tissue.

Treatment with LLLT/PBM lasers has positive effects on the body's lymphatic drainage system. Laser treatment can also stimulate the immune systems macrophages and thus reduces the risk of acquiring infection in the area treated. This is an important factor in improving the healing process for patients.

Benefits of Laser Light

The following is a list of the most notable improvements seen due to laser light treatment:

- Cell activity
- Cell metabolism
- ATP-production
- Improved local concentration of lymphocytes, leucocytes and macrophages
- Increased blood flow
- Collagen production
- Improved uptake of oxygen in the cells
- Na-K-pump is normalized
- Cell membrane potential is normalized

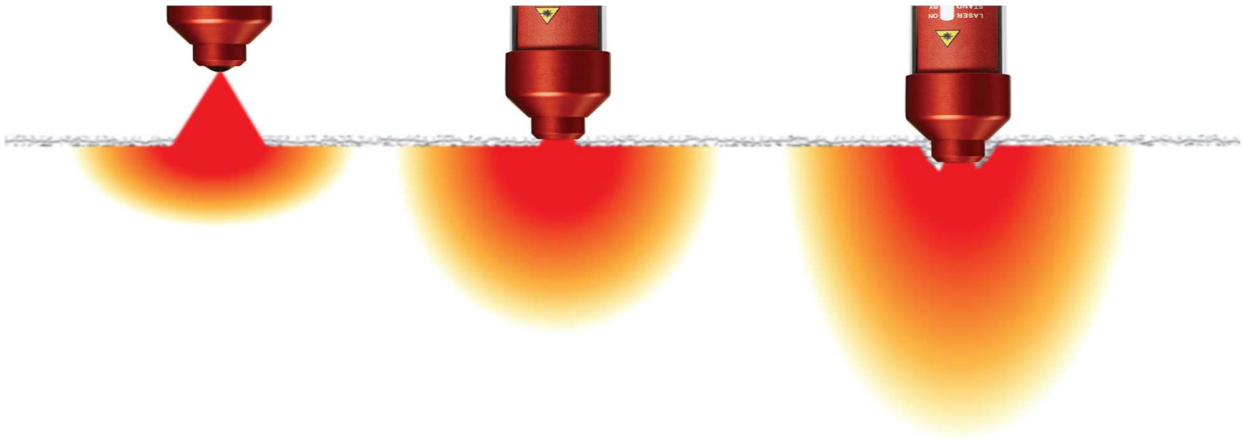
Positive Effects of Laser Light

Anti-inflammatory
Laser light stimulates the cells that control the inflammatory process. The effects manifests in the form of reduced swelling, redness, and local tenderness.

Pain inhibitory effect
When treating nerves with laser light there is an increased release of natural endorphins which have an anti-inflammatory effect. Endorphins reduce the release of compounds that increase the sensitivity of pain receptors. The analgesic effect is achieved by the stimulation of nerve points.

Increased release of various "building materials" from the cells
Collagen which is produced by the fibroblasts is the most significant 'material. Collagen in integral to almost all tissue - especially in the lower layers of the skin. The increase in collagen synthesis induced by the laser light is an essential factor towards the improved healing of wounds furthermore the increased production of collagen ensures the formation of scar tissue is minimized.

Release of waste products from the cells
This effect is of paramount importance during the treatment of tissue injuries and bruising.



LLLT/PBM is Approved as a Medical Treatment

Laser treatment with LLLT/PBM is a fully approved treatment. One example among many is that the Norwegian health authorities approved the use of LLLT/PBM laser treatment as a pain and healing treatment at authorized practitioners (01.07.2001). The U.S. Food and Drug Administration has approved the use of LLLT/PBM laser treatment for pain and wound management, but also as a treatment for tenosynovitis (CTS - Carpal Tunnel Syndrome).

In the EU, laser equipment for LLLT/PBM is CE labeled. This is because it is generally accepted as a medical treatment for pain and healing treatment and thus given the label “plus CE 2274 (TÜV NORD)”. The Lancet published in 2009 an article about the use of lasers for pain treatment of neck injuries (neck pain). This was seen as a major step towards a full acknowledgement of the positive benefits for laser light treatment.

Many doctors, veterinarians, dentists and physiotherapists and especially a great number of alternative medicine practitioners use laser light daily in their treatments. This is due to the fact that an increasing number of health care providers in all fields are realizing the many possibilities when it comes to laser therapy. This fact combined with an increased awareness and recognition due to the now more than 6000 articles, scientific studies and clinical trials worldwide. They have managed to form the scientific foundation that shows the significant effect of treatment with LLLT/PBM in relation to a variety of issues.

LLLT/PBM Research

40 years ago, research into the ‘*properties of lig*ht’ showed that laser light is effective and useful for the healing and regeneration of tissue. Numerous laboratory studies have since shown that photons produced by laser light in the wavelength range 600-1000 nm can penetrate the skin and affect each individual cell and increase cell activity. As noted previously, one of the major effects is increased blood flow in areas treated with laser light.

The latest research conducted by the Russian scientist and professor Tiina Karu, has shown what effect exposure to laser light has on cells at the molecular level. Karu’s research clarifies the cellular effect of laser light and is the basis for the scientific research still being performed on LLLT/PBM. Further details can be seen in Tina‘s latest book:

Ten Lectures of Basic Science of Laser Phototherapy

Advantages of LLLT/PBM laser treatment

LLLT/PBM = is a completely safe method of treatment and is easy to learn and use

LLLT/PBM = provides a painless treatment without the use of medication

LLLT/PBM = can render surgery unnecessary which makes associated risks avoidable

LLLT/PBM = positive clinical results with lasting effect

LLLT/PBM = faster treatment results

Side effects of LLLT/PBM laser treatment

There are no known serious side effects noted to date.

LLLT/PBM can cause mild redness on the skin that can occur temporarily in the treated area.

WARNING NOTICE!
- Never look directly into the laser light!
- The sight may be permanently damaged!
- When treating the face with laser light, always use laser safety goggles!

Treatment Photos ENERGY-LASER L500 PRO™






Important LLLT/PBM Clinical Studies & Articles

Search on Pubmed: National Center for Biotechnology Information (nih.gov)

Dato: 01.02.2021

LLLT laser = 8.000 + found items
PBM laser = 740 + found items