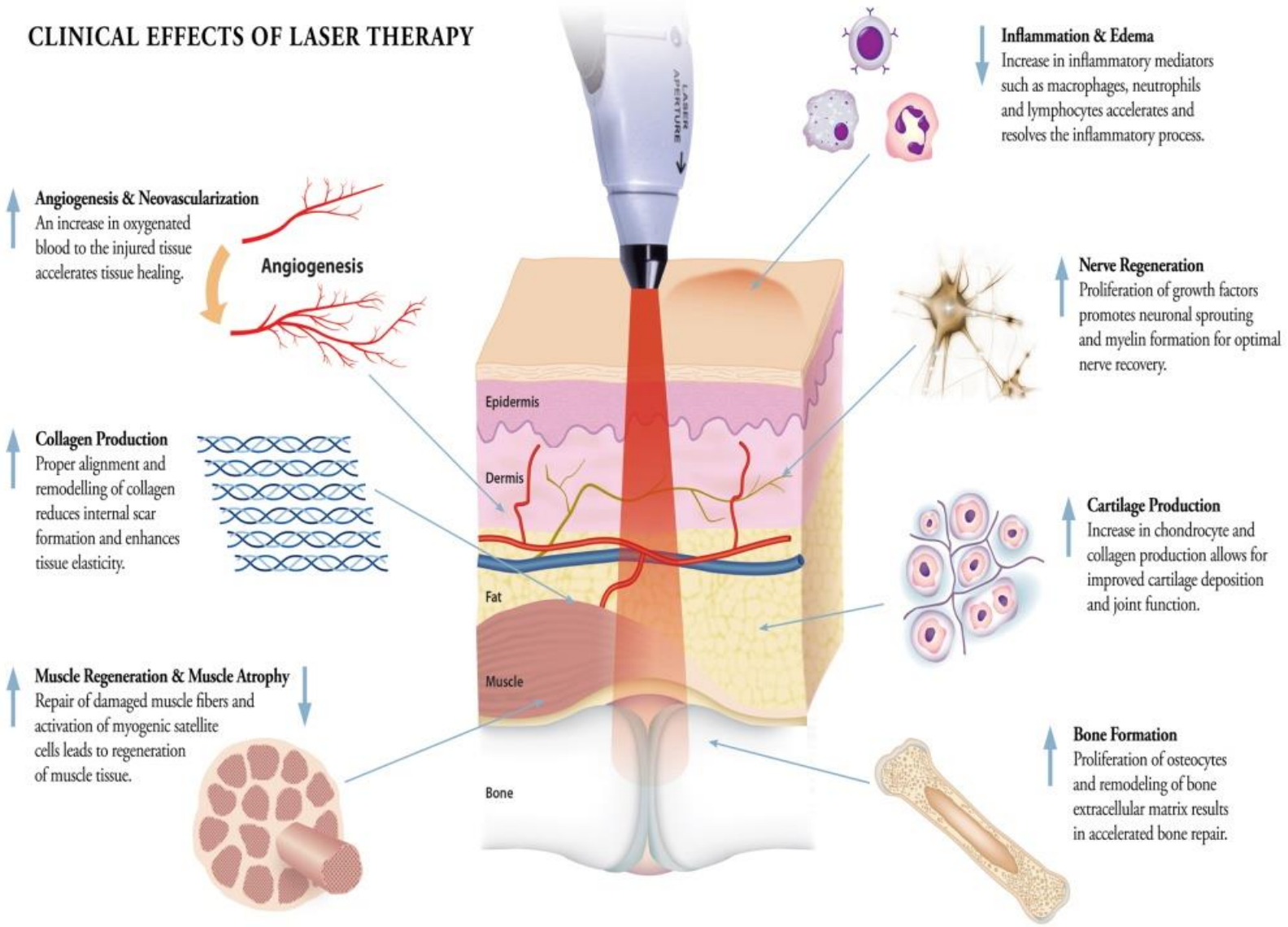
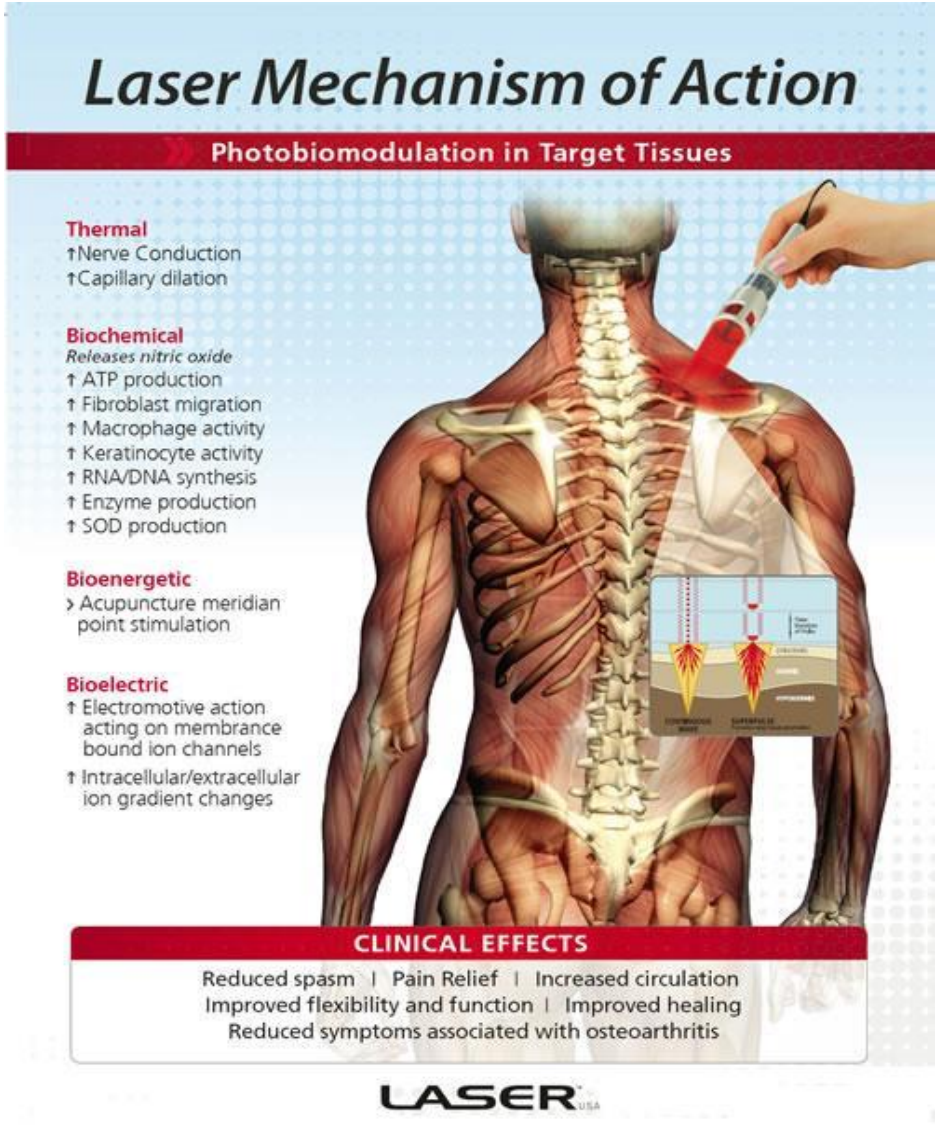
Dr. Fariba eslamian

MD

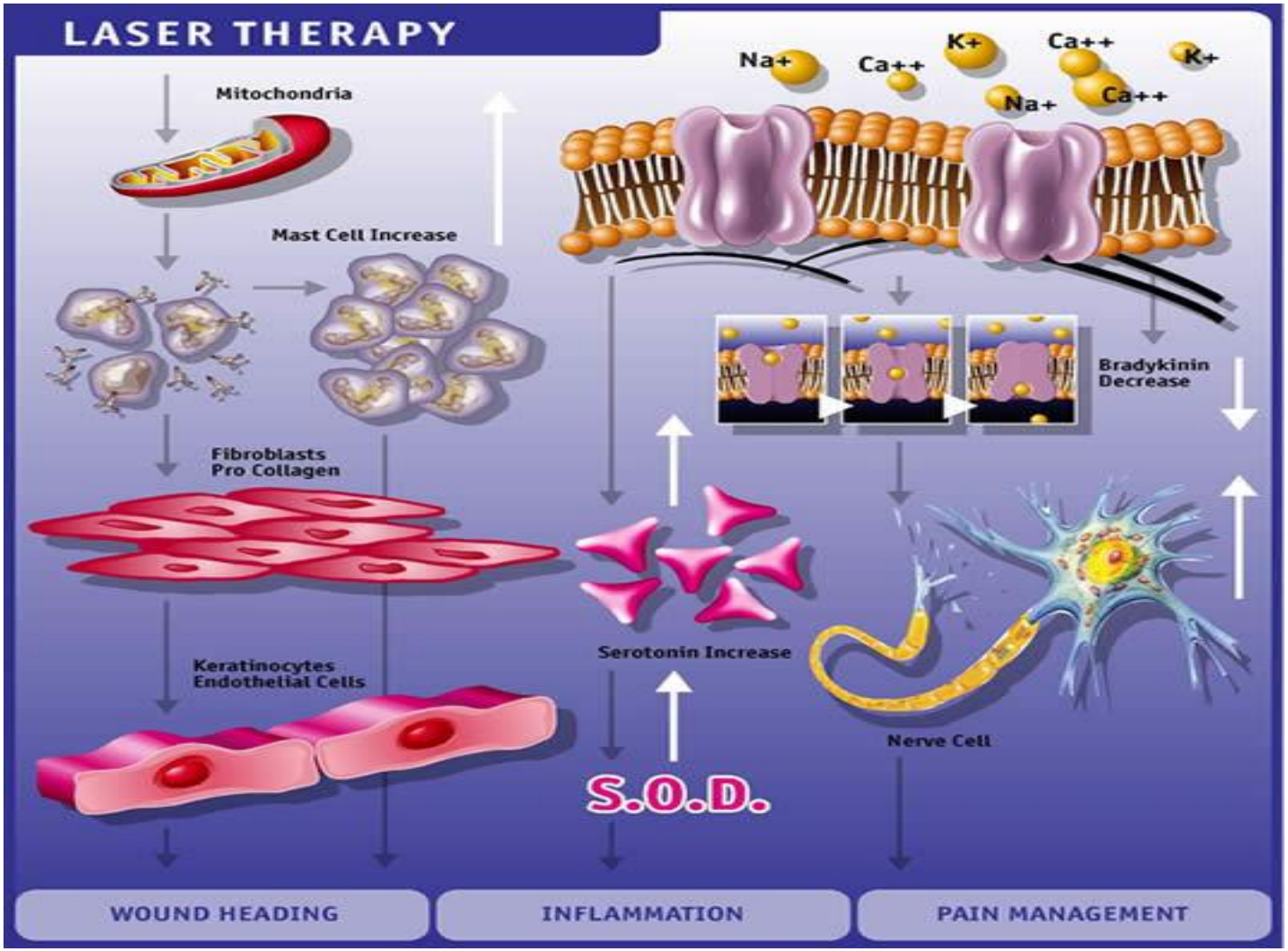
CLINICAL EFFECTS OF LASER THERAPY:-



LASER MECHANISM OF ACTION:-



LASER THERAPY:-



High Power Laser

- **Maximum working depth**

Many pathologies which afflict the muscular system are at depth. In these cases laser therapy is of fundamental importance: the beneficial effects it can bring about facilitate optimal physical recovery.

An advantage of laser therapy is its ability to work at depth and to resolve the cause of the pathology at its point of origin. This characteristic can be attributed to two properties of the laser: *wavelength and power*.

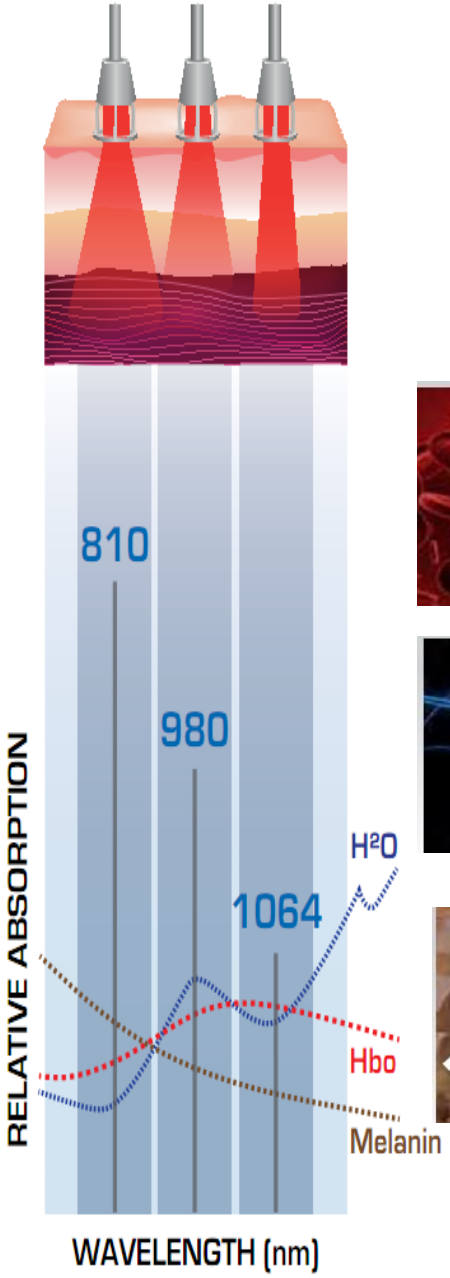
As is known, different wavelengths have different properties in terms of diffusion and absorption by human tissues, and for each therapeutic objective it is possible to select the most suitable wavelength.

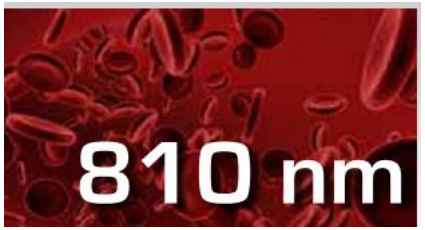
The emission power also increases the effectiveness of the laser, transmitting the beneficial effects to great depth. The greater the power transferred to the tissues, the greater the energy transmitted to the injury.

Therefore power is the main carrier in the transfer of energy.

Flexibility & Control

Patented System with 3 Wavelengths



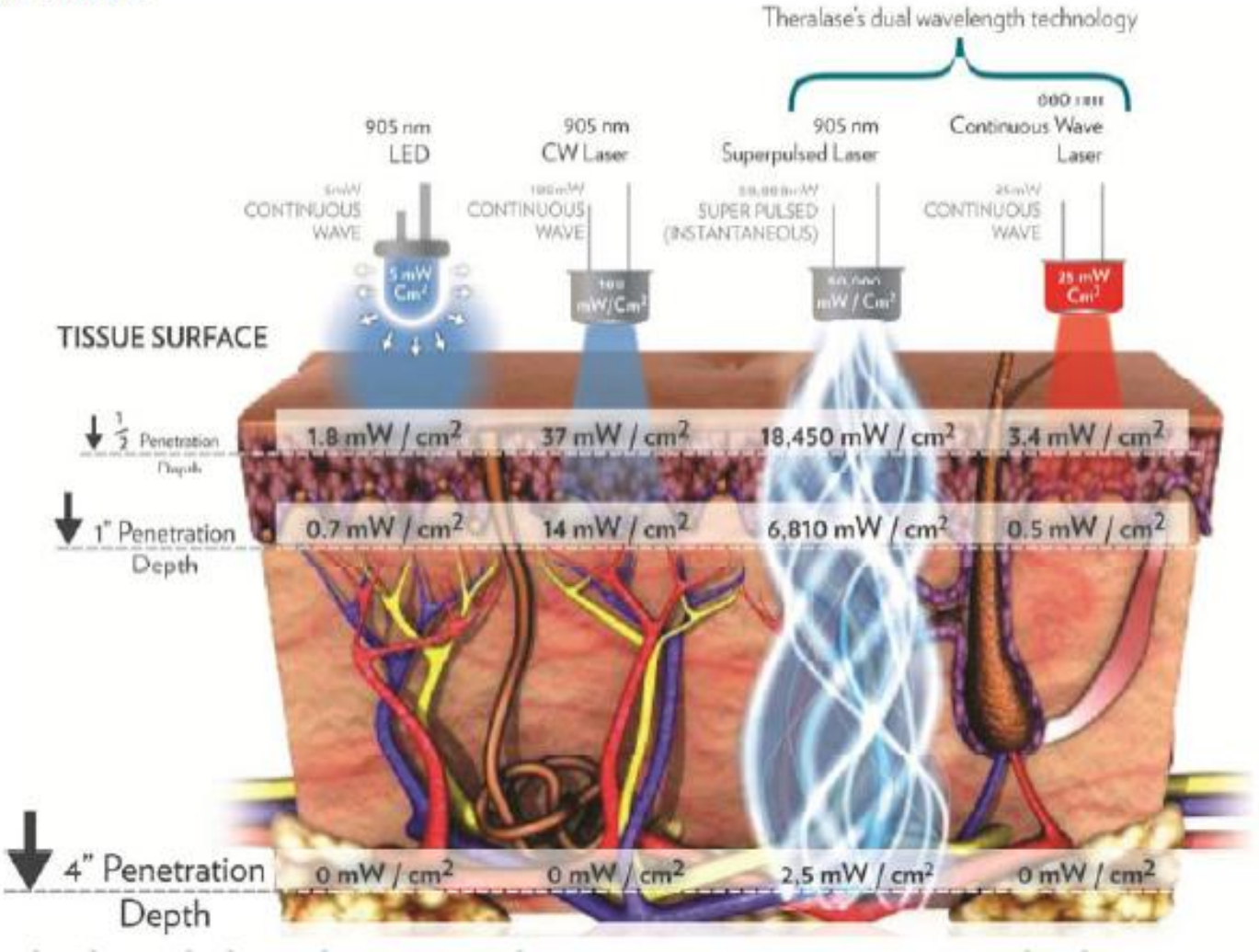


the 810nm wavelength allows rapid activation of the process of hemoglobin oxygenation: transferring the correct energetic supply to muscles and tendons, facilitating regeneration.

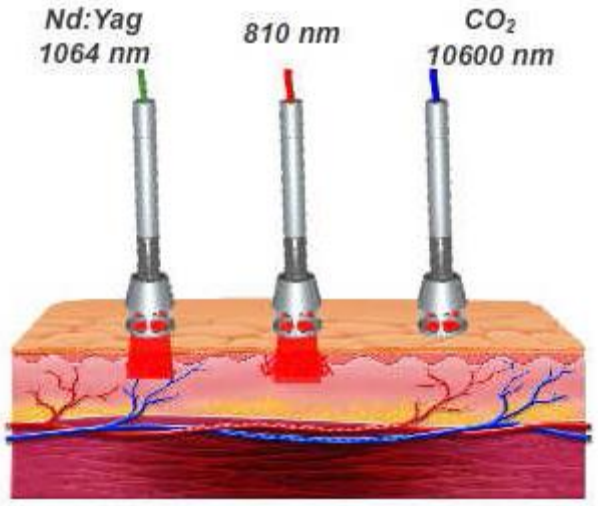
The 980nm wavelength optimizes the action on thermo and mechanical receptors. It activates the Gate Control mechanism for a rapid analgesic effect.

the wavelength with the least dispersion within biological tissues. Its high level of directionality allows the correct dose of energy to be aimed directly at the noxa.The result is a perfect synergy which harmonies the rapid analgesic effect with the control of inflammatory processes and the deep activation of metabolic processes vital for all cellular activities.

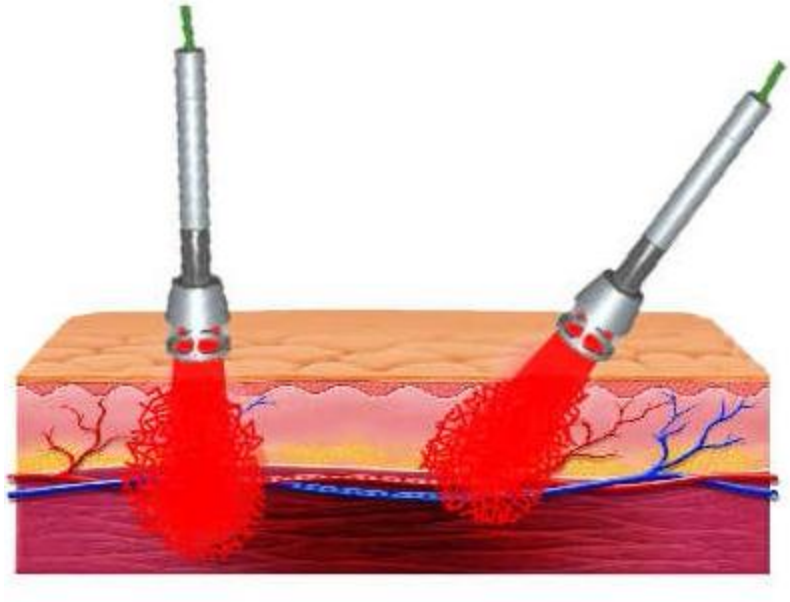
Figure 1. The diagram below represents the difference in depth of penetration between therapeutic lasers.



Comparison between wavelengths



The importance of orthogonality



Interaction Between Power & Depth (with the same wavelength)

- The ability of the laser to penetrate to depth is *often incorrectly attributed to only the wavelength.*

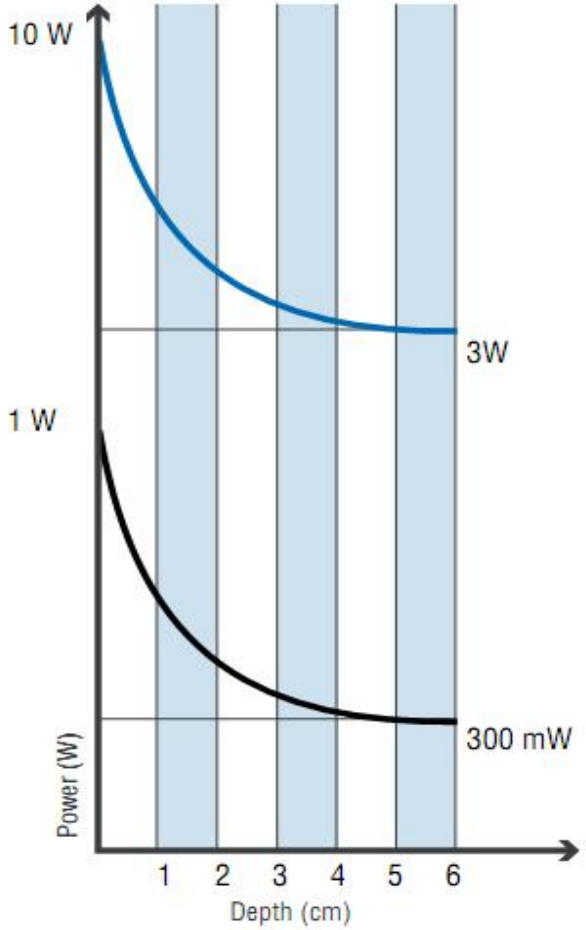
In reality, the **power** has a fundamental role in the therapeutic action of the laser on tissues.

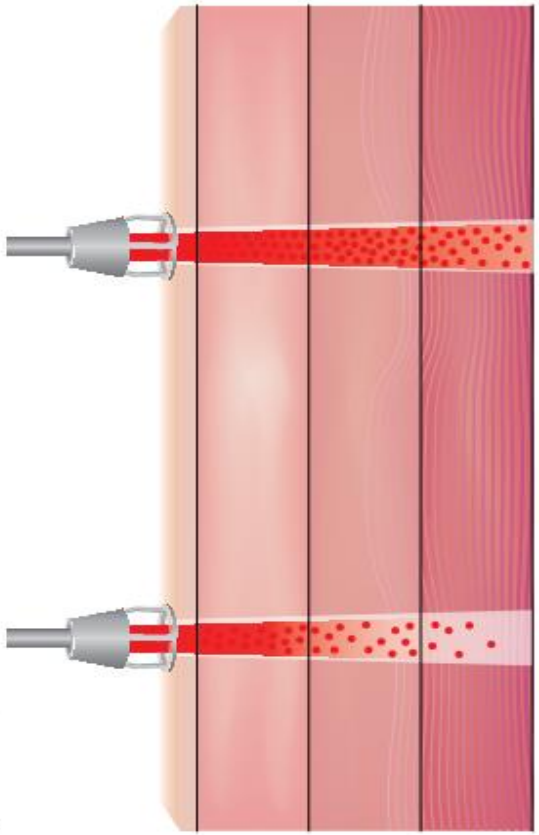
It is known that the power (Watts) represents the *quantity of energy which can be transferred in one unit of time* (1 Watt = 1 Joule for 1 second).

Energy reduction is inversely proportional to the reference depth.

Greater power transmits more energy, overcoming the natural dispersion of the laser and reaching the seat of the injury (see diagram opposite).

The more energy transferred, the greater the quantity which can be assimilated by the tissues.





Analgesic effect

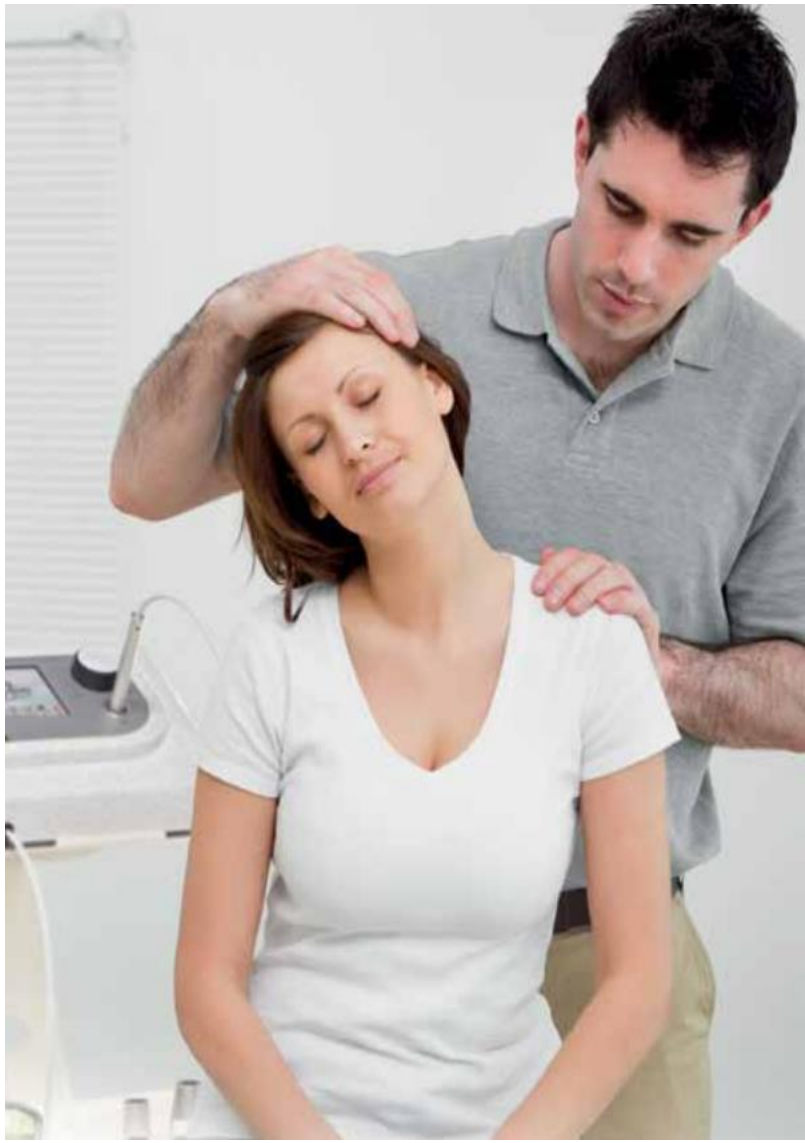
Rapid pain relief with no side effects:
Allows energy modulation to quickly combat muscular and joint pain.

Anti-inflammatory effect

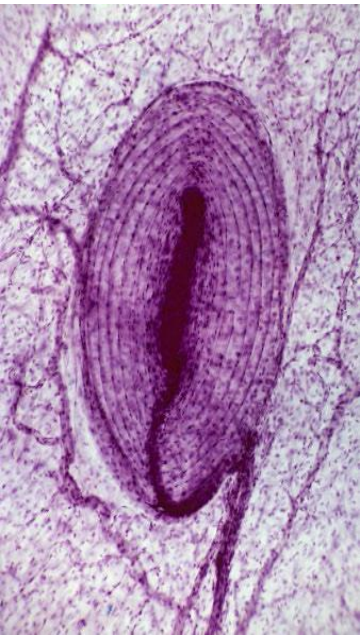
modulates the inflammatory processes thanks to its deep stimulation of tissues, triggering vasodilation, increasing oxygenation and therefore activating the main metabolic activities.

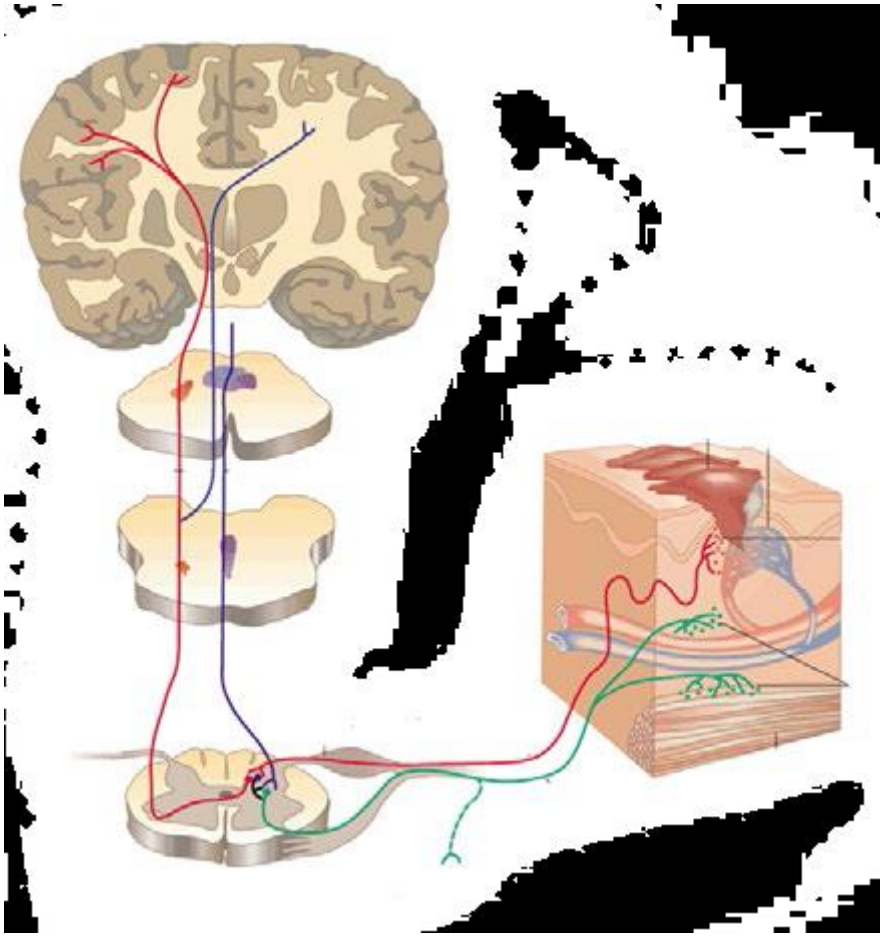
Bio-stimulant effect

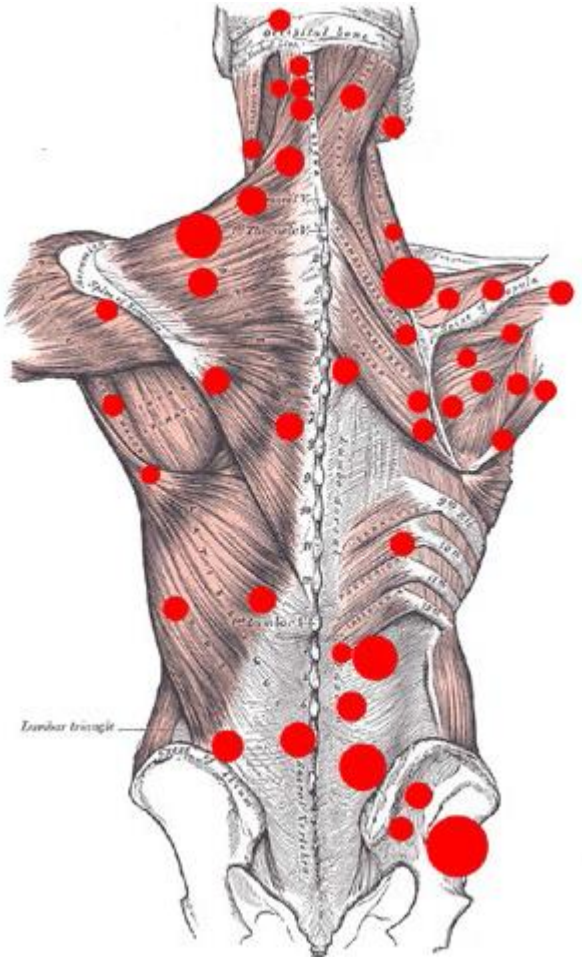
Facilitating energetic cellular processes,
increasing the remodeling of tissues by stimulating the production of collagen.



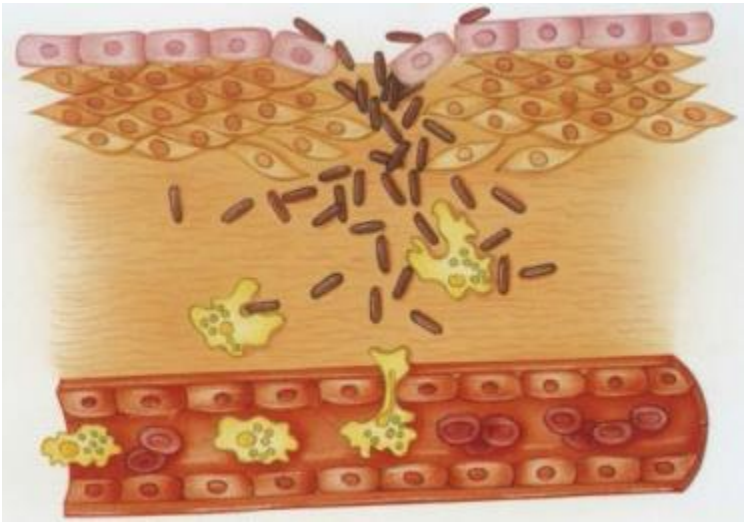
Analgesic Effect

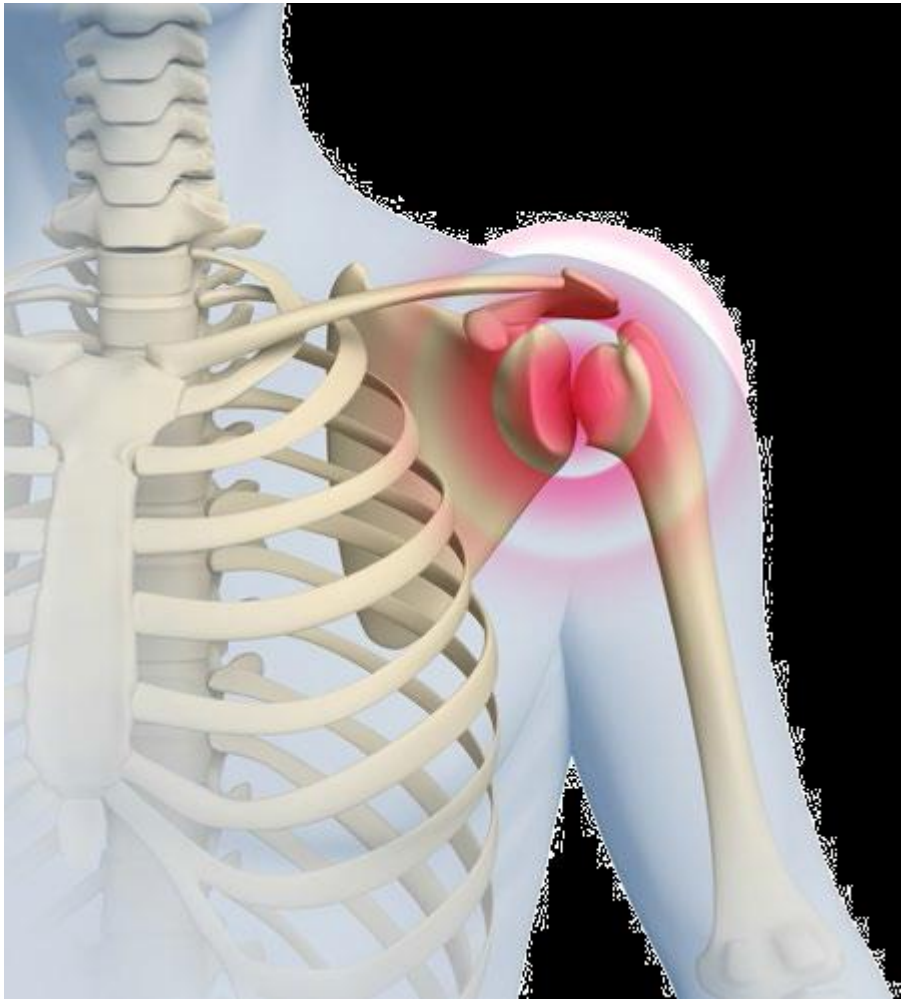






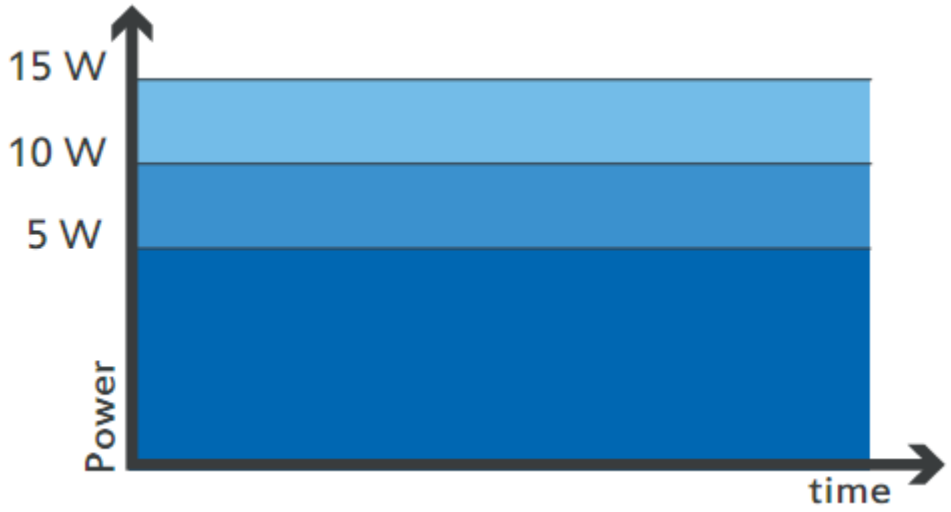
Anti-inflammatory Effect





Continuous Emission Mode

To activate bio-stimulation processes at depth.



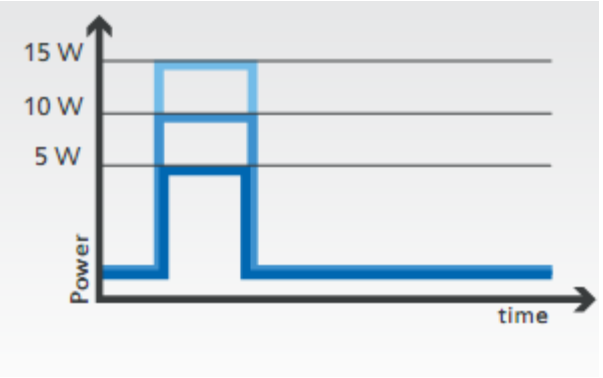
This type of laser emission is able to trigger cellular bio-stimulation processes, increasing production of ATP.

Scientific studies on the effects of laser therapy have shown how a laser impulse must have a duration of at least 100ms to activate cellular bio-stimulation. Therefore only a continuous impulse (or pulsed with emission duration of at least 100ms) is able to generate an effect in the tissue, thus facilitating the biological rebalancing of the cells. A cell which is stimulated by a laser tends to 'charge' with energy, returning to its primary physiological function. Therefore the continuous emission mode is essential to trigger the process of tissue regeneration, accelerating movement recovery times.The continuous emission mode is suitable for pathologies where the injury is at depth; the ability to work by activating the cellular reactivation processes allows fast bio-stimulation effects starting from the very first treatment.

Single Impulse

Precision and depth

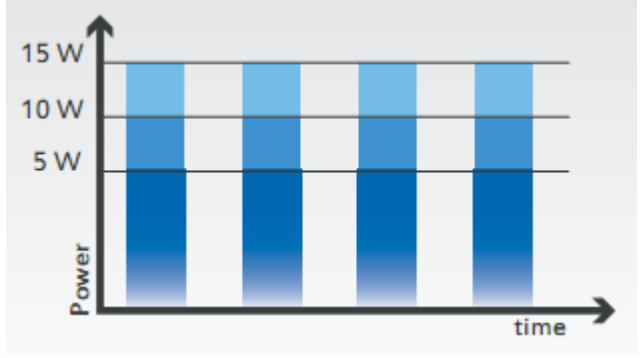
The laser emission is concentrated in *a single high-energy impulse with a precise, efficient dose*. To guarantee greater efficiency the amplitude of the single impulse can be adjusted by the operator, to guarantee **the most suitable treatment**



Pulsed Mode

Regular and modulated impulses

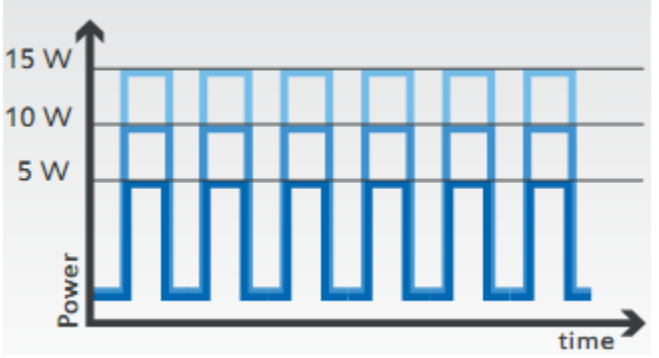
3 different modes to tailor the therapy during *the acute phase, optimizing both pro- and anti- inflammatory effects, and increasing bio-stimulation with low thermal impact.*
This mode allows the laser emission to be optimized according to prototype.



Burst Mode

high-Intensity Impulses

This mode is particularly suitable for relapsed *pathologies where chronic pain* predominates.
The series of impulses allows rapid interarticular angiogenesis and facilitates the restoration of cellular homeostasis.

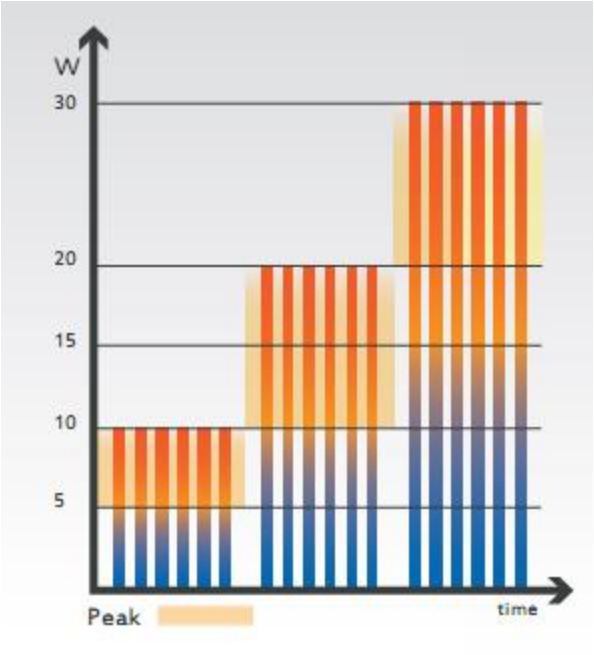


Antinf Mode

fighting Inflammation

Pulsed mode with specific anti-inflammatory setting. The process of nitric oxide release is fundamental to the rebalancing of micro-circulation.

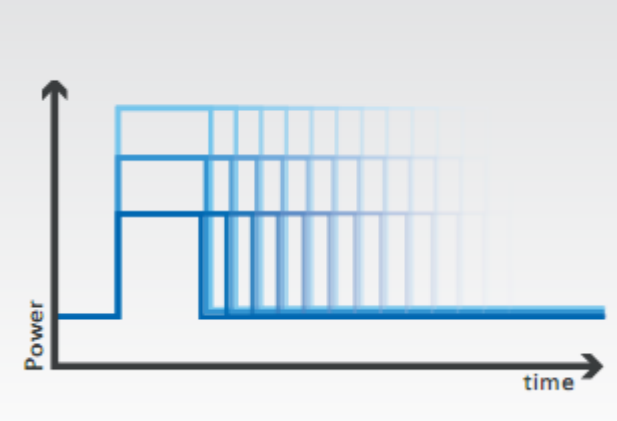
Through controlled vasodilation, the process of angiogenesis ensures the reactivation of lymphatic peristalsis and the collection of catabolites from the inflammatory process.



Custom Mode

Tailor - made emission

The need for energy which is ever more controlled and harmonized is met by the Custom emission mode.
It is possible to personalize the emission by adjusting the Duty Cycle and Frequency parameters, allowing the ‘design’ of the pulsed and super-pulsed modes according to the required characteristics of the therapy.



- ✓ *To get good and effectiveness result of the laser therapy. The following parameters are very important*

  1.Dosage of photonic energy

  2.Duration of the Treatment

  3.Angle of Laser beam penetration.

  4.Wavelenght of the probe

- ✓ *To achieve and to get good effectiveness from the laser therapy following parameters:-*

1. variable frequency from 200 Hz to 10,000 Hz to vary the power.

2. Variable power from 50 mw to 14w to vary the energy.

Energy=watt x time.

3.Variable pulse ratio 10%,20% up to 100% to vary the energy.

4.Variable treatment time

5.Variable treatment area in square centimeter

6.Automatic calculation of power

7.Automatic calculation of energy

8.Automatic calculation of energy density/ cm2

Energy= Power (mw) X Time(mts)

(According to the area of the pain applied energy will be varying so get decidable energy we have to vary the power so that we can select low dosages of energy as per Arndt-Schultz law of Bio modulation).

ENERGY SELECTION:-

- *In general superficial/acute pain 1 to 5 J/cm2 within 6 to 8 min.*
- *Deep/chronic pain 8 to 12J/cm2 within 6 to 8 min.*
- *If pain area is wider then multiply the energy.*

Frequency Adjustment

key increase the frequency up to 5000Hz for superficial/acute pain. Increase the frequency up to 10,000Hz for deep/chronic pain. When your increasing the frequency(right side of the frequency), corresponding power, energy and energy density will be calculated and displaying by the machine automatically.

- *When your increasing the pulsed% energy and energy density will be calculated and displaying by the machine automatically.*
- *By adjusting any one or two parameters (Frequency, pulsed%) you will be getting decided energy with in the decided time.*
- *By adjusting the area we will be getting corresponding energy density per cm^2.*

AREA OF TREATMENT:- (POINTED)

- *If pain area (Treatment area) is pointed i.e. 1 cm^2. as per the Arndt-Schultz law.*
- *And after examination of the patient select the energy with in 1 to 5 J with in the decided treatment time 6 to 8 mts keep the area in 1cm^2 because the area is pointed. Now, you can notice energy and energy density will be same unit.*

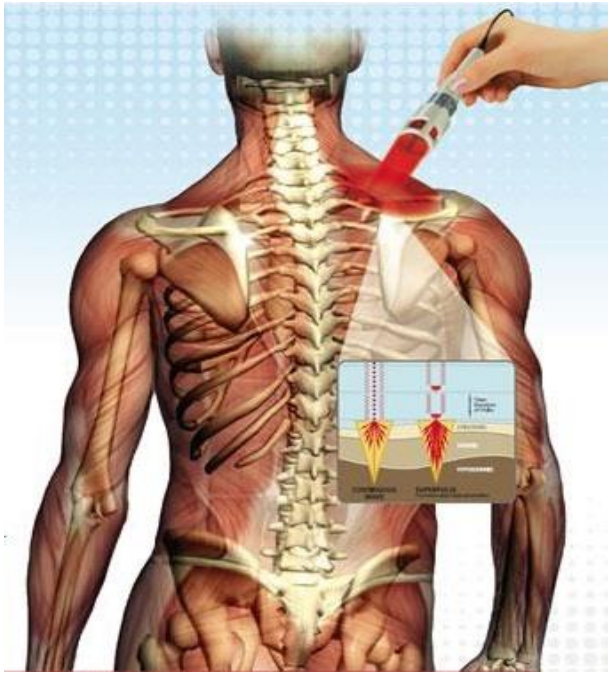
WIDER AREA:

- *Example:- Approximately treatment area is 4cm² .If you are decide 3J per cm2. So, total energy will be 4x3=12 Jules for 4cm²*
- *So, total energy is required 12J to treatment the area of 4cm².*
- *And keep the area in 4cm².So, total energy, energy density/cm2 will be calculated and displaying by the machine automatically.*

Open wounds treatment:-

- *When treating the open wounds the probe should be held slightly away from the tissue surface, whilst still maintaining a 90˚ angle. when you treat next patient please clean the tip of the probe.*

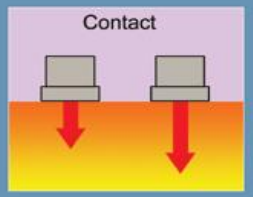
HOW TO ADMINISTER LASER

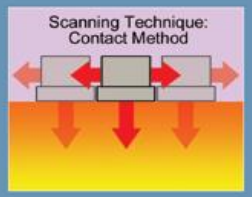


Program / Mode	1	2	3
Pulse Frequency	5 Hz	50 Hz	1000 to 3000 Hz
Time	5 Minutes	5 Minutes	5 Minutes
Systemic Effect	Tissue Repair / Healing	Anti-inflammatory	Acute Pain Treatment
Depth Of Penetration	Deepest	Medium	Superficial

Treatment Techniques

Treatment Techniques:

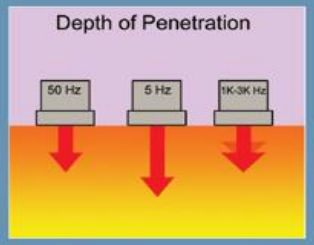




Contact: Surface contact with mild over pressure will provide not only better overall depth of penetration but also a more consistent dose.

Scanning method: This technique is used when a large area must be treated. The applicator is moved in the appropriate direction at a speed of 0.5 to 1.5 cm per second. Ideally suited for larger treatment tarrgets, however, due to an increase of serface area, treatment times may need to be increased to deliver a uniformdose to the entire area.

Laser Depth:



14 Common Phototherapy Treatments:

1) Neck Pain:
50 Hz, Static, 5 min to the painful side;
Variable 5 min to painful area.

2) Rotator Cuff Tendonitis:
50 Hz, 5 min, Static the top and back ofthe shoulder;
Variable, Scan, 5 min at the site of the pain;
50 Hz, Static, 5 min to cervical spine

3) Shoulder Strain:
50 Hz, Scan, 5 min if chronic, if acute
Variable, Scan 5 min to the front of the painful shoulder;
50 Hz, Static, 5 min on the painful area

4) Tennis Elbow:
Variable, Scan, 5 min slowly scan the elbow;
50 Hz, Static, 5 min to axilla of affected side

5) Wrist Pain and Arthritis:
Variable, Scan, 5 min to the painful joints of the hand;
50 Hz, Static, 5 min to the bend of the elbow of the painful hand

6) Rib/Thoracic Pain:
5 Hz, Scan, 5 min for each painful area;
Variable, Scan, 5 min to painful area

7) Low Back or SI Joint Pain:
5 Hz, Scan the painful side for 5 min;
Variable, Scan, 5 min to painful area

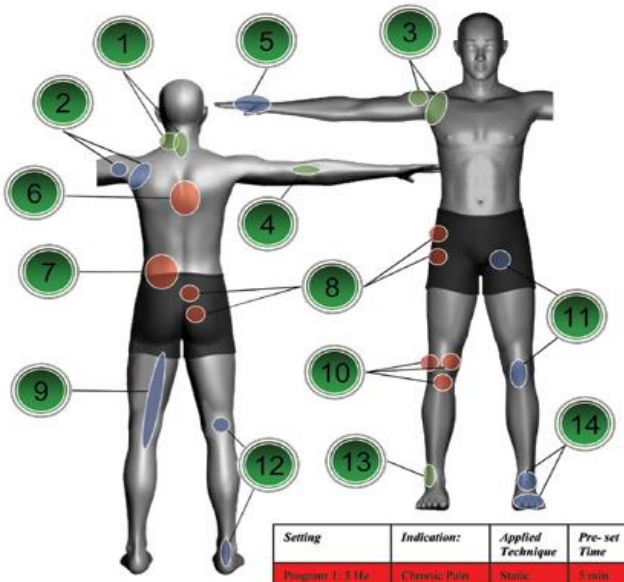
8) Hip Sprain:
5 Hz, Static to 3-4 spots around the hip joint 5 min each;
50 Hz, Static, 5 min to groin of the affected hip

9) Hamstring Strain:
50 Hz, Scan, 10 min along the tendon and muscle

10) Knee Sprain:
50 Hz, Static to the back of the painful knee 5 min;
5 Hz, Static to the front of the painful knee in 3 or more spots 2 min each

11) Patellar Tendonitis:
50 Hz, Scan the painful patellar tendon for 5 min;
50 Hz, Static, 5 min to the groin of the painful knee

12) Achilles' Tendonitis:
50 Hz, 5 min, Scan the painful ankle and tendon;
50 Hz, Static, 5 min to the back of the knee of the painful foot



Setting	*Indication:*	*Applied Technique*	*Pre- set Time*
Program 1: 5 Hz	Chronic Pain	Static	5 min
Program 2:50 Hz	Acute Pain	Static	5 min
Program 3:Variable	General Pain	Scan	5 min

13) Ankle Sprain:
50 Hz, Static, 5 min to back of the knee of the affected leg;
Variable, Scan the sprained ankle for 5 min

14) Arthritis of the Foot/Ankle:
50 Hz, Static, 5 min to the top of the foot;
Variable, Scan, 5 min the painful joints of the foot

TQ Solo™ Quick Reference Card

The Static technique is most commonly used. Hold the emitter over the area of pain with firm pressure, avoid moving the laser

The Scanning technique is used to treat a large area. The laser is moved slowly around the painful area