Low Level Laser Facts

Basic Laser Physics

In order to clarify how low-level laser therapy affects the body, it is necessary to review basic laser physics and developmental anatomy.

Laser means Light Amplification by Stimulated Emission of Radiation and was first theorized by Einstein. In 1960 Miaman developed the first laser, a ruby laser. This was a tube laser with a metal chamber, which contained the element ruby. When an electrical current excites the enclosed element, the atoms give off photons or packets of light energy. The photons bounced off a solid mirror on one end of the tube and out holes in the mirror on the other end of the tube. This light beam is unlike regular light in that it is coherent i.e., the photons are well ordered and synchronized. Laser light is also monochromatic, meaning it is of one pure color.

Power density is a key to laser energy. Power Density (PD), or light concentration is measured in watts per centimeter squared (W/cm2). The problem with most DC battery driven lasers is that the battery bleeds off and does not maintain a standard PD, which negatively affects low-level laser therapy (LLLT) results. Recent developments in miniature computers have enabled the patenting of techniques that maintain a standard PD as well as to control energy frequency.

Wavelengths are measured in nanometers. The most beneficial wavelengths are in the visible and near infrared ranges. These ranges are very safe ranges, far away from the damaging ultraviolet, x-rays, gamma and cosmic rays. Although the longer waves such as microwaves and radio waves are usually considered safe, there are some that think they might be damaging to the very sensitive individual. All wavelengths used in low-level lasers are safely divided from these potentially damaging waves. Many people only think of lasers as cutting lasers. In order to cut with lasers, it is necessary to increase the PD from 300 to 10,000 W/cm2. Lasers do not even have a warming affect unless they are operated above 5 W/cm2. Low-level lasers discussed here operate from 1 to 3 milliwatts.

Low-level lasers today are manufactured using semi-conductors, which are computer-like chips grown from various pure elements or combinations thereof. Combining the elements of InGaAlP makes visible light in the range of 630 to 685 nm; combining GaAlAs produces light in the range of 780 to 870 nm; and, combining GaAs produces infrared laser diodes in the 900nm range.

The visible light ranges, while quite beneficial, are limited by its shallow penetration of 1 to 3 mm. The invisible or infrared light range penetrates much deeper. Research documents infrared penetrations from 10 to 15 mm, but clinical results indicate that the infrared beam penetrates 8 to 10 cm. Excellent results have been achieved using the patented (Low Level Lasers, Inc.) concept of “piggy backing” the beneficial effects of the visible upon the penetrating ability of the invisible.

Low level lasers are used everywhere in our society, such as bar code check out, laser printers, compact disc players and for many medical procedures. In fact, without lasers, our society and economy as we see it today would collapse.

World-wide studies have shown that laser energy is accumulative as well as cascading and reduces pain and inflammation via:

1. Bio-stimulation and photo-stimulation.
2. Endogenous opiate production
3. Slowing sensory nerve production.
4. Restoring cellular resonant energy.
5. Stimulating the Na/K pump mechanism in the cell membrane.
6. Inhibiting bradykinin & leukotriene production.

Osmosis, a scientific fact taught in all grade and high school science classes, states that no nutrient can transfer across the depolarized membrane of an injured cell. One of the most important functions of low level laser therapy is to re-polarize sick and injured cellular membranes. This allows for essential nutrients to transfer from the blood into the cell. Research has shown that low level laser therapy can increase cellular ATP (body fuel) by as much as 150%.

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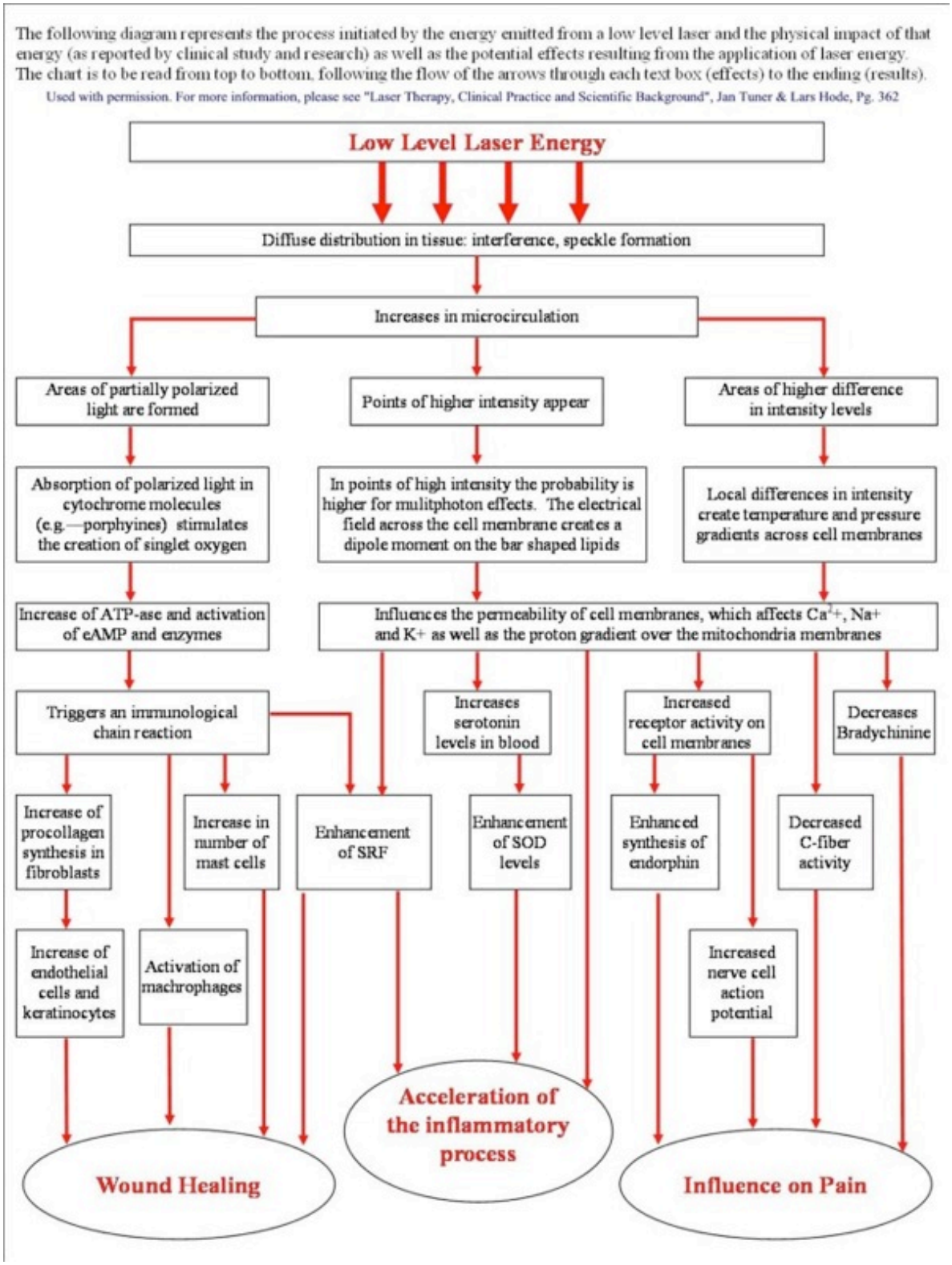
The Physiology of Laser Energy



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Veterinary Use Of Low Level Lasers

Low level laser therapy has been used in the US by veterinarians since the mid 1980's. These lasers are mostly higher power low level lasers. These lasers range in power from 20 mW in the visible light range up to 900 or 1000 mW in the infrared range. Wavelengths vary, but the most common are 650 or 660 nm in the visible spectrum and 808 to 830 in the near infrared spectrum. Some of these lasers are a single laser diode for acupuncture on animals or for the treatment of small areas, and others are clusters of lasers and LED's designed to treat larger areas. Veterinary lasers are registered with the FDA and are legal to sell and buy, but the company cannot make claims that they treat human disease or disorders.

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Low Level Laser Therapy In Medicine

NOTE! The following reviews of low level lasers is taken from recently published international literature, much of which is available utilizing any good web search engine and the search terms "low level laser" or "low level laser therapy". In most countries other than the United States, low level lasers are legal to use on human subjects by both medical practitioners and by the lay people themselves.

Low level laser therapy has been successfully utilized in medicine for:

- Acupuncture
- Acute myocardial infarction
- Allergy
- Blood irradiation
- Bechterew's disease
- Blood pressure control
- Bone regeneration
- Cancer
- Cardiac conditions
- Prevents restenosis after balloon angioplasty
- Decrease the number of angina attacks
- Eczema
- Alleviation of heart pain–cervicothoracic pain syndrome
- Suppression of lipid peroxidation
- Promotion of antioxidants
- Protection of erythrocyte membranes
- Reduction of fibrinogen level
- Normalization of antithrombin-III
- Reduction of arrthythmic deaths (two year follow up)
- Reduction of the activities of the hypophyseoaadrenocortical and aldosteron-renin-angiotensin systems
- Protective effect on erythrocytes caused by heart/lung machines
- Carpal tunnel syndrome
- Cerebral palsy
- Crural ulcers
- Depression, psychosomatic problems
- Diabetes
- Duodenal/gastric ulcers
- Epicondylitis (tennis elbow)
- Ear conditions including hearing loss and tinnitus
- Eye conditions
- Fibrositis/fibromyalgia
- Gynecological problems
- Headaches including migraine
- Hemorrhoids
- Herniated lumbar discs
- Herpes simplex (HSV1) of the lips as well as sexual herpes
- Immune system modulation
- Lichen
- Low back pain
- Microcirculation
- Mucositis connected with cancer treatment
- Muscle regeneration
- Nerve conduction
- Ophthalmic problems – stye MUST use less than 5 J/cm2
- Pain associated with any cause
- Rheumatoid and osteoarthritis
- Salivary gland disorders
- Sinusitis
- Spinal cord injuries

- Sports injuries of all types
- Strains and sprains of all types
- Tendonitis/bursitis and other locations on man and animals
- Tinnitus (ringing in the ears)
- Tonsillitis
- Trigeminal neuralgia
- Trigger point therapy
- Thrombophlebitis
- Tuberculosis
- Urology problems including inflamed prostrate
- Warts
- Whiplash and associated disorders
- Wound healing regardless of the cause
- Zoster (shingles)

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Low Level Laser Therapy Use In Dentistry

There are 230 positive studies done by 81 universities from 37 different countries showing from 80 to 95% success using LLLT on over 24 different dental procedures.

- Alveolitis (bone infection)
- Anesthetic – used alone to replace or in conjunction to enhance the depth or profoundness of dental anesthetic
- Aphthae ulcers (canker sores)
- Bleeding – postoperative bleeding control
- Caries – Used prior to drilling to PREVENT tooth hyperemia and postoperative pain
- Dentitio dificlis – pain around the coronal tissue of either primary or permanent teeth
- Endodontics – root canal – used to flush bacteria out of dentinal tubules and reduce pain associated with root canal
- Extraction – used before and after to control bleeding, pain, and speed healing
- Gingivitis (bleeding of the gums)
- Herpes Zoster (cold sores)
- Hypersensitive dentine - usually at gum line – many over the counter tooth pastes are sold with less benefit than LLLT
- Implantology – reduces inflammation, speeds healing, reduces inflammation, and increases bone growth
- Jaw fractures
- Leukplakia (precancerous tissue)
- Lingua geografica
- Lip wounds
- Mucositis associated with cancer medications
- Nausea – used prior to taking impressions to prevent gagging
- Nerve injury
- Oedema (swelling)
- Oral surgery
- Orthodontics
- Pain regardless of the cause
- Pediatric dental treatment
- Periodontics
- Prosthetics – denture sores
- Secondary dentin formation
- TMJ/TMD (temporomandibular joint and associated muscle disorders)

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