

*The  
Beneficial  
Applications  
Of  
Low Level  
Laser  
Therapy*

# *The Beneficial Applications of Low Level Laser Therapy*

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A medical experiment was conducted in a randomized, crossover, single-blind, placebo-controlled fashion on house painters, typists, computer operators, and other usual victims of carpal tunnel syndrome. The results were revealing and provided health professionals in North America, South America, Europe, and Asia proof that permanent relief for acute and chronic wrist pain is readily available.

*Carpal Tunnel Syndrome* (CTS), a common defect of the wrist and hand, is a disability affecting several million people in Western industrialized nations. It is caused by pressure on the middle nerve in the wrist's carpal tunnel. The condition offers much pain and often prevents the sufferer from pursuing any occupation involving wrist movement. The syndrome is seen more often in women, especially in pregnant as well as menopausal women. Symptoms may result from a blow, swelling, a tumor, rheumatoid arthritis, or an overly small carpal tunnel that squeezes the nerve. The median (middle) nerve serves a person's palm and thumb side of the hand. Pressure on the nerve causes multiple symptoms: weakness, pain when the thumb is bent toward the palm, as well as burning, tingling, and/or aching that may spread to the forearm and the shoulder. Weakness and wasting of muscles may occur from lack of wrist movement, getting in the way of full use of the thumb and fingers. Pain may be either infrequent or constant and is often most intense at night.

Now prolonged comfort is assured for sufferers of CTS because researchers in the Department of Neurology at the Boston University School of Medicine uncovered that *Low Level Laser Therapy* (LLLT) is highly effective in eliminating wrist pain completely. The pain-free results last for between one and three years. This medical school investigation involved just a small number, but it was convincing. Eleven people received red-beam laser therapy directed at acupuncture points along the painful hand and wrist. The true treatment was compared to a placebo or "sham" treatment which provided no therapeutic benefit. Both applications were painless, and patients could not tell which they were receiving because the affected hand was treated hanging behind a black curtain without the patient knowing if treatment devices were real or sham.

Proven by this July 2002 experiment is that the pain of carpal tunnel syndrome treated with a low-level laser directed at acupuncture points markedly reduces wrist pain or causes it to disappear altogether.

The application of *acupuncture* ordinarily involves placing fine needles at specific spots on the body's surface. Chinese traditional medicine theory holds that such points or skin spots connect with energy pathways or meridians that run through the body, and acupuncture keeps this natural energy flow running smoothly.

Prior to the application of LLLT, usual treatment had included painkillers, braces, steroid injections into the wrist joint, and/or surgery to "release" the ligament that runs through the tunnel and puts pressure on nerves. Most of the existing treatments are expensive, may produce pain by themselves, could have side effects, and often end up not working or giving only temporary relief.

Injecting steroids, for example, removes pain for an average of just three months. Moreover, only 40 percent of the CTS patients who undergo surgery are eventually able to return to normal functioning. The Boston University researchers mentioned that in 1993, treating one case of CTS in California cost over \$5,000 without surgery. A decade later the cost for such proposed correction by this conventional treatment has more than doubled.

For up to three years when the beneficial response to administering acupuncture using LLLT eventually wears off, this safe and effective treatment is taken again by the patient to achieve another long period of wrist comfort. Using low level laser therapy today, carpal tunnel syndrome patients can thus continue their usual occupations without experiencing any more pain in their wrists even under stress.<sup>1</sup>

## **What Is Low Level Laser Therapy?**

The word *LASER*, an acronym for *Light Amplification by Stimulated Emission of Radiation*, is the name of a device projecting intense radiation of the visible, ultraviolet, or infrared portions of the light spectrum. The laser instrument produces a very thin beam of light in which high energies are concentrated. The laser light, when reduced in its energy output to a low level, may be utilized for tissue healing and repair, cutting as in surgery, shrinking tumors, unblocking clogged arteries, eradicating infections, and other therapeutic purposes. For bringing about health enhancement, the application of these amazing beams of light is called “Low Level Laser Therapy.”<sup>2</sup>

In surgery, lasers can be used to operate on small areas of abnormality without damaging delicate surrounding tissue. For example, lasers are applicable for structural changes of the retina, to unblock coronary arteries narrowed by atheroma, and to remove certain types of birthmark (a nevus) on the skin. Different kinds of laser light—argon laser, diode laser, excimer laser, YAG laser—are put into service for operations on the cornea, lens capsule, and, as mentioned, the retina. Lasers are also applicable for the treatment of cervical intraepithelial neoplasia and in specialized form for endometrial ablation. Additionally, laser beams are advantageous as diagnostic tools; for instance, an instrument for measuring blood flow through skin tissue is known as the laser Doppler flowmeter.<sup>3</sup>

Because the amplification of light by the stimulated emission of radiation (the definition of a laser) occurs as an open system, it provokes completely new structure and sensitivity in the living tissue of an organism to which the light is beamed. The medical director of the Pain Clinic and Laser Center of Locarno, Switzerland, Zlatko Simunovic, M.D., F.M.H., writes: “Laser therapy [LLL] is a natural and biological therapy, because even from early ages, man has considered the light of the Sun to be responsible for his health. Human kind simply cannot live without the light, a fact proved by evident lack of light in the sick cell.”<sup>4</sup> Laser light restores health to just such an ailing cell.

## **How Low Level Lasers Operate**

The stimulated emission of a laser is obtained by controlling the instrument’s energy in its excited state and introducing the correct radiation to trigger it. The laser’s excitation occurs from collisions of its atoms of light with electrons discharging from the instrument’s power source. Laser beam buildup occurs and photons pass through the instrument’s extraction mirror so that the laser beam gets reflected back into the laser’s active medium.<sup>5</sup>

Numerous technical details relating to lasers could be discussed, but these individual items are issues which interest only physicists, electrical engineers, and laser specialists. Hardly ever are medical consumers or even holistic health professionals (for whom this article has been published) interested in laser technology. They merely want to witness the beneficial effects of LLLT.

Although, this author could describe *monochromaticity*, a laser radiation property, the technology is so complex, no meaningful purpose would be served even by defining it. Or I might relate laser radiation properties to *coherence*, the stimulated emission mechanism through which the laser radiation is obtained. My intention, instead, is not to burden the reader with idiomatic technical language entailing laser information. Only, some laser terminology should be included here in case a term comes up elsewhere.

Thus there is *spatial coherence* by which two laser beams originate from two different points producing interference fringes. And there is *temporal coherence*, whereby the laser radiation being emitted takes place at the same point that another beam of radiation is emitted at a later time.

Then one may come upon *directivity*, another property of laser radiation wherein the laser's radiation is confined within a beam which is propagating in space. Plus, the laser beam will have a certain *brightness* derived from the laser's intensity which is affected by the number of photons emitted outside the laser optical cavity.

Most people know that a *photon* is a quantum of electromagnetic energy having both particle and wave properties; it has no charge or mass but possesses momentum and energy. Next there is *polarization*, a nonspecific property of laser light related its electromagnetic radiation with certain spatial distributions.

These, and several dozen other aspects of physics may be integrated into the study of laser light and its associated therapeutics, but they are overly scientific for the more simplified requirements of using LLLT beneficially.<sup>6</sup>

## **The Modern Day Visionary of Laser Therapeutics**

Born in a South Dakota sod farmhouse with a birthing assist by his father, growing up in surroundings having no indoor plumbing, no electricity, and with nature's woodlands as his playground, the genius Larry Lytle, B.S., D.D.S., Ph.D. (in nutrition), has become a legend in his own time. Now at age 67, Dr. Lytle is the modern day visionary of laser therapeutics. Most of his waking hours are spent functioning as consultant and instructor/lecturer for a highly progressive laser device manufacturer. Even with this educator's lectures being exceedingly well attended, he derives no income from the manufacturer's distribution of laser instruments to medical consumers, health professionals, or any retail outlets.

Dr. Larry Lytle had been an immensely successful wholistic dentist, a profession from which he retired four years ago. Additionally this accomplished health professional performed as a Ph.D. nutritionist until low level laser therapy captured his imagination. It was then that he put into action his personal inventiveness to effectuate low level laser treatment. For the past ten years Dr. Lytle has been perfecting positive laser therapeutic responses to help people, and he owns patents for the legal protection of his inventions. Accordingly, benefits have come to humankind from the biological absorption, dispersion, refraction, reflection and other physiological reactions to laser light energy (please see Dr. Larry Lytle in **Photograph 1**.)

## Descriptions of Four LLLT Instruments

Laser instruments are manufactured in a variety of shapes and sizes. Some are handheld as with cordless telephones; others are pencil-thin and aimed like flashlights. One hand-held laser, *the Q100*, incorporates four light-emitting diodes and four laser diodes with red and infrared laser outputs.

*The light-emitting diode (LED)* is a light source with a relatively narrow band. The LED is actually a semiconductor lamp which produces primarily red light emitting a wavelength of 660 nm. But some LEDs also emit yellow, green, or blue light. *The laser diode* is an electron tube of the high-vacuum type inserted into the laser instrument. It has a cold anode and a heated cathode, used as the rectifier of alternating current; it's a demodulator.

The Q100 operates on rechargeable DC batteries and affords two settings, one that harmonizes the brain and heart and a second for several effects: healing tissue, reducing inflammation, and eliminating pain. Small and maneuverable, the Q100 may be applicable for surface injuries of domestic animals such as horses. It is useful for healing the traumatized animal's cuts, bruises, burns, sprains, ringbone, navicular, pasterns, wind puffs, splints, stifles, and proud flesh. It can penetrate deeply for treatment of difficult problems such as bowed tendons, tendonitis, arthritis, and bone trama (please see the horse's healing leg in **Photographs 2, 3 & 4**).

*The Q1000 laser instrument* is implanted with 20 diodes clustered in a hand-held, ultra-portable, telephone-size unit and contains additional capabilities which furnish frequencies from 1 to 20,000 Hertz. It produces healing in a sort of "shot gun approach" to cover a large area of injury. It is computerized and may be reprogrammed at the factory to produce frequencies and power densities that are beneficial for specific health problems. Powered by 7.2 V intelligent Lithium-Ion batteries, the Q1000 laser delivers its multiple wavelengths, power settings and time intervals through several different modes. It contains more than twice the number of lights and lasers and a broader energy range than the Q100 so that the Q1000 harmonizes a wider range of therapies for animals and humans.

Much like the Q100, however, the Q1000 is used for the treatment of chronic pain and inflammatory conditions such as burns. The healing and pain-elimination effects of LLLT for human and animal burns, in fact, is fast and dramatic (please see its fast healing of a leg burn in **Photographs 5, 6, 7, 8 & 9**).

*The 660-Enhancer* is a 50 mW "red laser" used for acupuncture in place of needles, for stimulating trigger points, and for many dental application. This pencil-thin laser is powered by the Q1000.

*The 808-Enhancer* is a 500 mW "infra red" laser in a small hand-held probe the size of a large pen. The power of this infra-red laser has been noted for its beneficial result in controlling bone infections and stimulating bone growth. An FDA-approved laser of the 800-wave lengths are utilized for carpal tunnel syndrome as reported at the beginning of this article.

## **Class I, FDA-Registered and UL-Classified Lasers Are Safe**

I have attended Dr. Lytle's educational lectures delivered to laypersons and health care practitioners alike. He teaches about the effects of low level laser administration. When given as treatment for a dysfunctional body part, low level laser light emitted by Class I laser instruments such as the Q100, Q1000, or others variably called the Rotary Multiplex and the Resonator have no potential at all for harming the user or the recipient. These various Class I devices are registered with the US Food & Drug Administration, and they have received their classification based on research completed by Underwriters Laboratory (UL). They offer what the governmental agencies indicate is "non-significant risk (NSR)."

Unquestionably low level laser therapy is completely safe. (Please read the last subsection of this article about laser risks and adverse effects.) I personally own four low level laser instruments for administering therapy to myself, friends, and loved ones. These therapeutic lasers have been invented by Dr. Larry Lytle, who for me exemplifies a holistic health visionary at the highest level. Projected for production is a television video which will cite his personal genius, along with other exceptional medical scientists and health care professionals who are "health visionaries." Each of them is deserving of an American-type of Nobel prize.

## **The Physiological Repair Effects of LLLT**

The physiological repair effects of low level laser therapy are achieved by the light's re-energizing (repolarizing) injured and malfunctioning cell membranes. LLLT also increases the mitochondria's energy output within the cell by more than 150 percent. The extra energy becomes a repair and restoration mechanism so that the damaged cell begins to thrive once again. This extra energy's cellular repair is graphically shown for a small boy who fell off his bicycle (please see the series of three pictures depicted in **Photograph 10**).

Advantageous actions of low level laser therapy take place in all organs and tissues of the body for the creation of good cellular functioning once again. Listing their antipathological and prophysiological internal and external benefits would have me producing a very long series of human conditions and treatment results—maybe several hundred. I will furnish a mere handful here. They include:

- A reduction of pain by the body's production of endorphins;
- The diminishing of inflammation from suppression of tissue excitation;
- The stopping of a tissue's influx of fluids;
- The disappearance of swelling, redness, and heat;
- The elimination of pain;
- The elevation of lymphatic drainage;
- The increase of blood circulation;
- The flow of healing enzymes into a traumatized area;
- The measureable showing of up to 75 percent increase in enzymes;
- The spasm release of tight muscles (both smooth and striated) which had been creating chronic pain, joint stiffness, and decreased mobility;
- The speeding up of bone repair from the stimulation offered by fibroblastic and osteoblastic proliferation;
- The canceling wave effect of viruses, fungi, bacteria, and a variety of parasites so that they fail to survive as pathological organisms.

Since the biostimulative-regenerative, anti-inflammatory, and analgesic characteristics of low level laser therapy had begun during the past half-century, a massive number of laboratory and clinical studies have been conducted. Perhaps upwards of 2500 published pieces have appeared in the medical literature in the form of clinical journal articles, magazine articles, letters to the editor, official reports, lectures, books, and more. In the next section a smattering of four significant published items are cited to show the variety of LLLT applications for healing purposes.

### **Abstracted Articles Taken From Medical Literature Which Illustrate Healing With Low Level Laser Therapy**

1. In the dental endodonture clinic of G.R. Sousa, DDS, M.S. Ribeiro, DDS, and E.B. Groth, DMD, 15 patients were treated for a total of 18 periapical lesions associated with the need for jaw bone repair. One group of 9 patients received endodontic treatment and/or periapical surgery. The second group of 6 were subjected to the same procedures but in addition their lesions were irradiated with low level laser light. LLLT was performed during 10 sessions with an interval of 72 hours between treatments. Bone regeneration was evaluated through X-ray examination. The results showed a significant bone repair improvement in the endodontic group of patients who had received LLLT. Their quick surgical healing occurred in half the time.<sup>7</sup>

2. Both clinically and thermographically, improvement was observed among some 40 patients suffering from Raynaud's phenomenon after they received 10 sessions of LLLT distant irradiation during winter months. Digital blood flow was assessed and the subjective and objective parameters were significantly better upon evaluation after conclusion of this published clinical study.<sup>8</sup>

3. Of 60 patients between the ages of 20 and 65 years who were victimized by cervical osteoarthritis (COA), LLLT was applied for the condition's relief. The people were randomized into two equal groups and given LLLT or a placebo laser. Patients in each COA group were investigated in a double-blind fashion without the doctors knowing who had received which type of application. The doctors evaluated patients for pain-related physical findings such as increased back muscle spasm, loss of spinal curvature, range of neck motion restriction before and after therapy. Functional improvements showed up significantly in the low level laser therapy group and not at all in the placebo group. From this and several dozen other clinical studies, it's recognized that LLLT works well for back trouble involving arthritis and muscle spasm.<sup>9</sup>

4. *Endovascular surgery* (operations dealing with the interior of the blood vessels) has advanced enormously by the use of LLLT. Lasers are administered to treat peripheral vascular disease, which are diseases of the blood vessels of the extremities (especially those that interfere with blood flow) such as in atherosclerosis.

A prospective study was undertaken for 89 endovascular procedures performed during a one-year period to determine their effectiveness. They included 50 balloon angioplasties, 32 laser-assisted balloon angioplasties, and 7 atherectomies (removal of the atheromatous lining of the vessel). *Balloon angioplasty* involves a balloon-tipped catheter that's threaded through the occluded vessel to the point of obstruction; the balloon tip is inflated and deflated several times to open the vessel. The indications for such surgery include intermittent claudication, weakness and cramps of the legs (occurs in 65.2 percent of patients); critical ischemia with loss of blood

supply (30.3 percent); and failure of a vascular bypass graft (4.5 percent). Immediate success was achieved in 89.8 percent of the endovascular surgical cases using LLLT. These excellent results immediately after operation are consistent with previous reported findings.<sup>10</sup>

I possess about 400 reprints of clinical journal article abstracts which discuss more beneficial physiological effects of low level laser therapy. The vast majority of them offer glowing reports about laser light healing and only a tiny fraction are negative. LLLT is applicable and quite efficacious in veterinarian medicine too.

## **Risks and Adverse Effects Associated With LLLT**

Some 2,500 controlled studies presented in as many medical/dental journal articles which have been carried out at university hospitals and private medical clinics, in dental practices, at veterinarian offices, at private and government-run laboratories, and in laser centers all over the world demonstrate positive effects of laser light on cellular and histological systems of people and their domestic animals. Veterinarian medicine is an especially active area of low level laser therapy application. Veterinarians, in fact, have carried out the majority of *in vivo* animal studies to test laser treatment before it is administered to human test subjects.

During the course of *in vivo* investigations both in the laboratory on animals and at the clinic level on people, certain risks and side effects of LLLT and its employment of visible light have been uncovered. For the Class I lasers that I described earlier in this article, there is no potential for eye damage according to published books and laser therapy experts I've consulted.

Writing in their book, *Low Level Laser Therapy: Clinical Practice and Scientific Background*, the coauthors from Sweden, Jan Tuner and Lars Hode, warn: "A parallel [laser] light beam of small diameter is dangerous for the eyes. That's because it can enter the pupil in its entirety and be focused by the eye's lens to a spot with a diameter of hundredths of a millimeter. The entire [laser] light output is concentrated on this small area. With a 10 mW beam, the power density can be up to 12,000 W/cm<sup>2</sup>."<sup>11</sup> It is mandatory that no one should stare into a laser light. Shorter exposure time offers much less risk of injury, and the blinking reflex is good protection. Please be aware that the use of normal sunglasses rather than wearing true laser lens protectors tends to increase the risk of eye injury. That's because the filtration mechanism of sunglasses is lower in the laser spectrum, and the darkness of the sunglasses makes the pupil dilate to let in more light. They provide a false sense of security. The laser beams of LLLT discussed previously are under 5 mW and considered safe.

The effects of LLLT on cancer cells *in vitro* have been studied, and it's known that such abnormal cells can be stimulated to grow. *In vivo*, however, small malignant and benign tumors in rats treated with LLLT recede and completely disappear. The situation is the same for bacteria and viruses in culture. The *in vitro* cultured organisms are stimulated, but the infections of *in vivo* microorganisms disappear more quickly. The lasers for LLLT already discussed are harmonizing and not stimulating.

LLLT is used today in nearly every field of medicine and health. It's not yet known how laser light can influence the immune system of oncological patients, but diseases of the lymph system, blood and arteries do receive benefits from the application of laser light. Although LLLT does not always obtain a 100 percent therapeutic response, it should be applied for the relief of pain and fast healing of wounds. Among the basic rules in nature is that "light is the source of life." The quantum of light energy is a photon. Every living cell emits photons, known as biophotons. For this reason, LLLT is therapeutic without causing damage to the

human body. Laser light is an integral part of the natural physiology of mankind. It is a dependable healing modality.

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**Photograph 1.** Depicted is health visionary and laser consultant Larry Lytle, B.S., D.D.S., Ph.D. (Nutrition), who is world renown as an expert on low level laser therapy. Dr. Lytle holds patents for numerous modifications to laser instruments. He is the developer of low level laser theory and applications which have brought benefits and enriched the lives of people around the world.



Photo 2



Photo 3



Photo 4

**Photograph 2.** Seen here is the right rear leg of a brown mare injured by barbed wire. Infection followed by gangrene later set in. The veterinarian who had been consulted tried a variety of conventional treatments to heal the horse's leg, but all of them failed. Discouraged by his lack of success, the veterinarian advised that the mare be "put down" (killed). Instead, the animal's owner, an Amish farmer from South Bend, Indiana, used his Resonator laser over the entire wound surface each day for a few days. Then he applied low level laser therapy to the mare's leg every other day, and finally weekly for a total of eight applications.

**Photograph 3.** As shown, the healed result of laser therapy was a huge scar that kept the mare limping and prevented her from being entered in "show" due to the scar's unsightliness. Consequently, the farmer treated his horse's scar with the Resonator laser once a week for three weeks, which allowed the hair to grow back into the scarred site.

**Photograph 4.** How is it possible that hair would grow again into a scarred area when almost any health professional will tell you that the regrowth of hair into scar tissue just does not happen? The answer is that the farmer's Resonator laser delivered a correct amount of energy at the proper power density and thus re-energized the injured cell membranes in the scarred tissue. This energy reinforcement allowed the transport of nutrients to occur across the skin's cellular membranes which, subsequently altered the tissue's DNA (deoxyribonucleic acid). From such a healing action, the horse's skin returned to normal and regrew hair. This mare was saved from being killed, return to "show" status, and, since the barbed-wire accident which befell her, has produced three foals.



Photo 5



Photo 6



Photo 7

**Photograph 5.** A thirty-eight-year-old man inadvertently stepped into a water-filled hot tub which had its thermostat discontinuing to work. The water temperature had risen in the tub overnight to 140 degrees and, believing the thermostat's reduced reading, the man sustained a serious second degree burn to a large area of his lower right leg. Believing in the healing power of lasers, the man immediately applied both his Resonator laser and Rotary Multiplex laser for two hours on that first day of receiving the burn wound.

**Photograph 6.** As the pain subsided, which began right away, the time spent lasering the burn was decreased on subsequent days. Aloe vera and ice were used in conjunction with low level laser therapy. In the usual course of treating burns of this serious nature, doctors know that at least four weeks of healing are required. The risk of infection and scarring are probable complications too. Here, on day three following the injury, the leg has turned a bright red as the injured skin has sluffed away.

**Photograph 7.** By day four, the wound appears exceedingly red, indicating that rapid regeneration of capillary tissue is occurring. Laser treatment is being continued using the Resonator laser and Rotary Multiplex laser. Plus, silver nitrate salve is being applied to the wound adjunctively.

**Photograph 8.** On the seventh post-injury day, the new tissue forming took on a deep purple appearance as a result of the tissue's rapid collagen formation. LLLT is continuing.

**Photograph 9.** By day nine, the leg shows that injured skin is healing well and the severe second degree burn is disappearing rapidly. The leg now appears as if it has a mild sunburn, with no scarring or infection. Looking closely at the photograph, you can see evidence of hair growing back in the burn area.



Photo 8



Photo 9



Photo 9

**Photograph 10.** Depicted here is a series of three photographs of a five-year-old boy who has sustained facial injury in a bicycle accident. The child's primary teeth are displaced back into the roof of his mouth. The labial plate of bone was also fractured causing considerable swelling around his lips.

As treatment, the Resonator laser was used daily for six days, two minutes each on the nose, the lips, and the cheeks.

By the injury's second day lip swelling was gone, and the scab that had formed disappeared by the third day. But by day six, there was literally no evidence of the injury inside or outside the mouth.

This little boy's injuries were monitored continuously. From steady laser usage, the child's primary teeth did not turn dark. His permanent teeth came in normally and showed no evidence of damage. Nothing works better for quick repair of injury and trauma than low level laser therapy.

