

# **Low Level Laser Therapy in Companion Animal Medicine and Surgery**

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## **INTRODUCTION**

My interest in low level laser therapy (LLLT) arose from a presentation by Dr. Larry Lytle at the VSLS meeting in Washington, DC in the fall of 2002. Dr. Lytle introduced us to a modality of treatment using low intensity light energy (<500mW) that is non-invasive and complimentary in nature.

Low level laser energy is reported to provide physiological benefit without detrimental side effects. Positive changes and lack of side effects bolster owner perception of value for innovative, non-invasive treatment options. In fact, our clients perceive themselves as guardians rather than owners of companion animals. Treatments that are not reliant on pharmaceuticals appeal to care givers today.

Low level laser therapy has been used in the treatment of several human and animal diseases (Ghamsari et al 1997; Lucroy and Edwards, 1999). Byrnes, in Dr. Anders' laboratory at the Uniformed Services University of Health Sciences promoted regeneration of the corticospinal tract of rats using photobiomodulation (Byrnes et al, 2000). Her research suggests that LLLT inhibits inflammation and cell invasion of the spinal cord. In addition, they found that cutaneous wound healing in type II diabetic rats was accelerated with low power laser irradiation (Byrnes et al, 2000). Brosseau at Oxford has shown LLLT to provide short-term relief from pain and morning stiffness in humans with rheumatoid arthritis (Brosseau et al, 2002). This alternative, non-invasive treatment uses a light source that generates extremely pure light of wavelengths that are effective through photochemical reactions in cells rather than through a thermal effect.

There is a paucity of literature regarding LLLT in veterinary medicine. Several scientists and clinicians find the idea of LLLT promoting tissue repair and healing as unbelievable and view it with extreme skepticism (Enwemeka, 1999, Bartels, 2002). At Greenland Animal Hospital, we use LLLT in an integrated approach to case management. Utilizing LLLT in conjunction with thorough diagnostics and pharmaceutical therapies has been valuable. While LLLT can be used as the sole patient therapy, we have achieved more success using it in conjunction with conventional western medicine.

The purpose of this paper is to document the use of LLLT for different illnesses of dogs and cats treated as sole patient therapy and in conjunction with traditional methods.

## **LASER PHYSICS AND PHYSIOLOGIC EFFECTS**

It is not my intention to elucidate laser physics in this report. Readers can find authoritative materials describing laser-tissue interactions in other literature (Peavey, 2002; Jacques, 1992). It is, however, useful to briefly discuss the basic concept of low intensity light therapy.

Einstein first proposed the theory of Light Amplification by Stimulated Emission of Radiation (LASER) in 1917. Miaman engineered the first ruby laser in 1960. During the 1960's, laser biophysics evolved whereby light-tissue and light-substance interactions were clarified (Crane, 2002). Today there are multiple types of lasers with several unique applications.

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Lasers convert one kind of energy (electrical) into another kind of energy (photonic or light energy). They then are capable of releasing energy in a focused manner to a desired source. When electrical current stimulates a specific medium or element, the atoms of that medium give off photons. Photons are packets of light energy. Laser light energy is one pure color (monochromatic) and coherent (synchronized or well ordered). Power density (measured in watts per centimeter squared), wavelength (measured in nanometers), and frequency (measured in Hertz) are critical to understanding laser energy. Power density is light concentration. Photons travel in waveform at different frequencies. Each photon thus, each waveform, is characterized by a different wavelength. Wavelengths in the visible and near infrared ranges are the most beneficial for LLLT. Each wavelength interacts with a given substance in a different way (Peavy, 2002). Low level lasers that we used are manufactured using computer-like chips grown from pure elements and combinations of pure elements (Wowapi, 2002).

Everything in nature, including, tissue cells, bacteria and viruses, has a unique frequency. Laser energy elicits effect by altering or shifting the frequency of cells. Biophotons are involved in cell communication through a process that is termed “ultra-weak cell radiation”. The cellular source of radiation is DNA in the nucleus. It is believed that malignant tumor cells lose their mutual light contact, resulting in increasing cellular disorder. Exogenous light energy is absorbed by means of the flavoprotein –metal-redox system. This “antenna pigment” forms a link in the respiratory chain within cellular mitochondria. Laser photons are transformed into cellular energy in the mitochondria where energy impulses lead to physiologic change. Laser light also causes proliferation of collagen threads and increases in cellular activity. (Petermann, 2000).

Physiologic effects of laser energy in the body are numerous. Reported effects of LLLT include: vasodilation, reduced blood pressure, improved capillary circulation, and increased endogenous opiate production (Petermann, 2003). Laser energy reduces pain and inflammation through bio and photo-stimulation of living cells. Sensory nerve production is slowed and resonant energy of tissue cells is restored. Low level laser energy stimulates the sodium potassium pumps in cell membranes, which enables transport of essential nutrients into cells to allow healing. In addition, bradykinin and leukotriene production is inhibited by low level laser energy (Wowapi, 2002).

## **EQUIPMENT**

Lasers that we used for our study were purchased from a company based in South Dakota, USA called 2035, Inc. These lasers are multi-frequency resonating lasers with two or three programmed modes. Each mode is designed to re-energized different parts of anatomy. Mode 1 (M1) re-energizes muscles, ligaments, and tendons for healing. Mode 2 (M2) normalizes heart and brain cells. Mode 3 (M3) cycles through 29 different frequencies and is used on all organs, “unknown conditions”, and cancer. Two basic units, the Q1000 (grey) and the Q100 (black) exist. Q1000 produces 3.9 joules of energy per 3minute cycle. When attached to the Q1000, the 808-Enhancer will deliver 50 joules of energy to selected sites. There is a probe used for acupuncture that can be attached to the Q1000. The Q100 produces 1.3 joules of energy. Each unit was used for a specific disease or condition. Laser Assist Compound® is a dietary supplement that Dr. Lytle recommended as adjunct therapy. The product has a variety of nutritional ingredients, including Glucosamine Sulfates (<2900 mg/ounce), graviola, and co-enzyme Q10.

## CASE STUDIES

### CASE # 1: Feline Granulomatous Fungal Infection:

Magic: 10 year old, twenty three pound, neutered, male, diabetic cat with FLUTD

Magic had a non-healing wound on the left side of his nose. We tried topical treatment with Bactroderm® and then Tresaderm®. He improved initially with topical Tresaderm® application but the lesion never totally resolved. After one year of sporadic treatment, the owners were ready to be aggressive about finding a diagnosis. We debulked and ablated the mass with our CO<sub>2</sub> laser and sent off a biopsy. It was diagnosed as a granulomatous fungal infection. Treatment options were systemic antifungals or LLLT. The owners opted for LLLT as a first line of non-invasive therapy. Our treatment involved the Q1000 laser with the 808-Enhancer directed at the lesion for three minutes. We also added ½ teaspoon of laser assist compound to Magic's diet. The cat was not cooperative so we changed to the Q1000 M1 every 72 hours for two weeks then one time weekly for 3 weeks. The lesion improved initially, but after one month of no treatment the lesion returned larger than before. At the second surgery, we performed a full thickness skin excision and sent tissue to a different lab for histopathology. It was identified as granulomatous fungal infection (*Candida species*). We put Magic on itraconazole (5mg/kg) every 12 hours for thirty days.

#### Assessment:

The lesion improved when we used LLLT. However, it returned when we stopped treatment. We were not using a specific frequency for *Candida species*, therefore, we were not optimizing the efficacy of LLLT. In addition, we had an uncooperative patient which made it difficult to keep the laser focused for the entire treatment period. The lesion is healing with itraconazole therapy. The cat still does not tolerate any type of medication or treatment very well. We do not know if continued LLLT at appropriate duration and frequency would resolve the lesion.

### CASE # 2: Canine Submandibular Abscess

Casey: 8 year old, spayed female, Golden Retriever, in remission of Lymphosarcoma

Casey presented with a swelling of sudden onset under her chin. We were very concerned because of her history of Lymphosarcoma. Physical exam revealed a round 3 cm diameter, fluctuant, submandibular mass. Purulent fluid aspirated from the mass. Cytology revealed white and red blood cells too numerous to count and rare larger round cells. We excised the mass, sent a biopsy out for histopathology, sent a specimen for culture and sensitivity, and used LLLT. The mass had a thick capsule that was successfully excised with the CO<sub>2</sub> laser. We decided to have the wound heal by second intention. Pasteurella multocida and Corynebacterium species were isolated.

We applied the Q1000 M1 to the wound every 48 hours for 5 treatments. In addition, Casey took Baytril (68mg) orally every 12 hours.

#### Assessment:

The incision healed rapidly and was totally closed in seven days. No significant scar tissue was evident and the owners were thrilled with the use of non-invasive modern technology. Since we had a known pathogen that could be life threatening, I did not feel comfortable using LLLT as sole therapy in this case. It was excellent complimentary medicine.

### CASE # 3: Chronic Nasal and Pododermatitis

Mr. Boots: 15 year old, neutered, male, cat, FIV positive

Mr. Boots came to us for a second opinion on chronic, painful, nasal and pododermatitis. He presented with an open sore on his nose and painful feet, which were more severe in the rear. We verified positive FIV status and started treatment with Acyclovir and L-Lysine. Mr. Boots went home with Malaseab® shampoo for frequent baths and soaks. Although he improved over two year period, Mr. Boots was never totally comfortable. Enrofloxacin, amoxicillin, and doxycycline made Mr. Boots vomit or become lethargic.

In November 2002, we used Q1000 M3 on all four feet for 3 minutes each session and on the nose. We also put Mr. Boots on clindamycin (50 mg) daily for 7 days. After three sessions, one every 48 hours, Mr. Boots was walking comfortably on four feet and not licking his nose. We have used LLLT monthly over the last two months as Mr. Boots has a flare-up of discomfort. Recently, we amputated P3 of three of the most severely affected toes with the CO2 laser. We applied LLLT (Q1000 M1) after surgery. Healing was uneventful. The owners reported that Mr. Boots is doing very well.

**Assessment:**

The owners felt that Mr. Boots is more comfortable than he has been in years. His feet and nose are free from lesions at this time. They attribute this to the addition of LLLT. However, given his FIV status, I would expect to see recurrent problems.

**CASE # 4: Canine Lick Granuloma - Lymphosarcoma**

Max: 12 year old, neutered, Chocolate Labrador, hypothyroid

Max presented with severe dry skin and generalized epidermal collarattes. He also had a two by six centimeter raised lick granuloma on his right flank. The owners tried home remedies including neosporin, for several days. They were not interested in surgery given Max's age. Max was also severely arthritic in the rear quarters.

We treated the lesion with Q1000 M1 for three minutes every 48 hours for one week then one time weekly for three additional weeks. Max took Primor® (1200mg) daily for the first week

We also resonated his lumbosacral junction with Q1000 M1 and adjacent muscles with Q1000 M1 at thirty second intervals.

Max returned in two months with more generalized sores. We took a skin biopsy. The histopathological diagnosis was Cutaneous Lymphosarcoma.

**Assessment:**

Low level laser therapy worked well as sole therapy for the original lick granuloma. Changes were evident within one week of treatment. The owner did not return for two months, at which time Max came in because he had more epidermal collarettes. Laser therapy helped for a short time in the initial phases of this case. It did not cure cancer. We subsequently euthanized Max.

**CASE # 5: Canine Femoral Head and Neck Excision (FHNE)**

Mazie: 2 year old, spayed, female Labrador with Bilateral Hip Dysplasia

Mazie has bilateral hip dysplasia. We performed a unilateral FHNE in the fall of 2001. She returned home postoperatively with carprofen, and a glucosamine product. The owner watched her progress to normal function and decided to wait to perform surgery on the opposite side until Mazie showed signs of discomfort.

Approximately one year later, Mazie returned for surgery on the contralateral side. At this time we were offering LLLT as an adjunct to surgery. We prepared Mazie for surgery. Prior to surgical scrubbing we resonated her coxofemoral joint with Q1000 and 808-Enhancer for 3 minutes. Surgery was uneventful. Postoperatively, we resonated as prior to surgery. The following morning, we repeated our resonance, however, at this time we used Q1000 M1. Mazie was weight bearing as she left our hospital. She returned home with carporfen and glucosamine. Within 24 hours the owner called the hospital to tell us how well Mazie was doing and wondered if LLLT could have done so much. Ten days after surgery we removed sutures. Mazie was walking on all four limbs and had a small visible scar with significant hair regrowth.

**Assessment:**

Low level laser therapy did enhance wound healing and sped recovery in the case of FHNE.

#### **CASE # 6: Azotemia and Perirenal Cyst in a Cat**

Chill: 15 year old, spayed, cat

Chill presented for a second opinion on having anesthesia for dental cleaning. The previous veterinarian was concerned about putting an older cat under anesthesia. Pre-anesthetic blood values revealed mild Azotemia (BUN= 43.9; Creatinine= 2.76 ;). Phosphorous concentration was normal. Abdominal radiographs revealed enlarged kidneys. Renal ultrasound revealed an active unilateral perirenal cyst with a suspected ruptured cyst remnant surrounding the contralateral kidney.

The owners wanted to clean Chill's teeth but did not want to surgically remove the cyst. We decided to drain the large cyst by needle aspiration, perform dentistry, and resonate the kidneys. In addition, we used the acupuncture probe on a point in the right ear and on the back.

Chill did well during anesthesia and we were able to accomplish all procedures. As a follow-up we performed LLLT (Q1000 M3) every 48 hours for two weeks, then weekly for 6 weeks. Based on abdominal palpation, the cyst filled in one week but has been reducing in size over the last several weeks. Chill has been eating Purina NF and Pet-tinic® since diagnosis. Her owners report that she is acting like a kitten and doing things that she hasn't done for many years. They are reluctant to stop LLLT.

#### **Assessment:**

It appears that a combination of diet, vitamin supplementation, and LLLT are enhancing the quality of life of this cat. The owners are excited believers in LLLT.

#### **CASE # 7: Osteoarthritis, Urinary Incontinence, and Vestibular Dz**

Brittany: 15 year old, spayed, female Brittany Spaniel

Brittany presented with a several year history of uncontrolled urinary incontinence. She recently was experiencing an arched back and rear limb weakness. She had been taking phenylpropanolamine for several years with some improvement at times. Screening blood panel and urinalysis revealed normal organ function with dilute urine. Radiographs revealed multiple areas of lumbar spondylosis.

We resonated L4 to L7 with Q1000 M1 for three minutes and adjacent epaxial muscles with Q100 M1 at thirty second intervals. We added DES 1mg daily for five days then weekly for five weeks. Brittany improved rapidly over the next several days.

Four months later, Brittany presented disoriented, with a head tilt to the left, horizontal nystagmus and one episode of vomiting. In addition, she was weak and unstable. Her blood panel was normal. Her symptoms were compatible with Canine Vestibular Disease. The owner asked if LLLT would be appropriate. We resonated the skull with Q1000 M2 in two locations for three minutes. Brittany went home on dexamethasone and Primor.

Her clinical signs improved within 24 hours. She was relatively normal after two weeks.

#### **Assessment:**

Low level laser therapy may enhance recovery from Vestibular disease and ease the pain of Osteoarthritis. It is not clear if LLLT helped to treat the urinary incontinence.

#### **CASE #8: Obstipation and Osteoarthritis**

Zac: 15 year old, neutered, male, Setter Mix

Zac presented three years ago with obstipation. His diet consisted of ice cream, chicken, and plenty of fresh water. We performed several enemas. Physical exam revealed a rectal mass with anal stricture and severe degenerative joint disease in his back and hips. Not knowing how long Zac would live, we attempted to manage him with dog food (Purina EN) and vetasyl capsules. The mass continued to grow. Veterinary surgeons attempted to remove the mass, but were only partially successful. Zac had monthly episodes of obstipation for 8 months..

Zac started LLLT in November of 2002. During our initial session we resonated his rectal area with Q1000 M3 and lumbar spine with Q1000 M1 for 3 minutes each. We also resonated his epaxial and semitendinosus/membranosus muscles at 30 second intervals with Q100 M1. We resonated his heart with Q1000 M2 for 3 minutes. This same technique was used every other day for two weeks, then one weekly for one month, then every other week for 2 months. He is currently coming for one session per month. Laser Assist Compound ® was started at one teaspoon per feeding.

Zac is not a cooperative patient so movement was an issue. Laser Assist Compound ® was not palatable. Zac has not had an enema for over six months. The owner feels that LLLT saved his dog's life. Zac can now climb stairs and snow banks which he had not done for several years. He starts to slow down after about three weeks without LLLT.

Assessment:

The results in this case speak for themselves. Low level laser therapy has improved the quality of this dog's life.

**CASE #9: Osteosarcoma**

Bailey: 4 year old, neutered, male, St. Bernard

Bailey was presented with a firm swelling in the right distal radius/ulna. Radiographs revealed lucent areas in the bone. A veterinary oncologist offered amputation and chemotherapy. The owner elected to euthanize Bailey when he seemed uncomfortable. After returning from Dr. Lytle's presentation, we discussed LLLT with the owners. Realizing that cure was a very unrealistic, we proceeded to resonate Bailey with Q1000 M3 three times weekly for 60 days. Bailey ate 1 teaspoon of Laser Assist Compound every 12 hours.

There was no improvement with treatment. We euthanized Bailey when he became too painful to walk.

Assessment:

Low level laser therapy did not arrest or cure advanced Osteosarcoma.

**CASE #10: Cervical Neck Pain**

Molly: 10 year old, spayed, female Daschund

Molly presented with ventroflexion of her neck and yelped when the neck was manipulated. We resonated her neck with Q1000 M1 for 3 minutes in two locations and the corresponding epaxial muscles with Q100 for 30 seconds each. Because she lived over an hour from the hospital and this was a recurring problem for Molly, she went home with dexamethasone (.25 mg TID for 5 days, .25 mg SID for 5 days, then .25 mg every other morning) in the event that LLLT did not improve her condition.

There was no improvement with twenty-four hours so the owner used dexamethasone. The medication provided relief with four hours.

Assessment:

One LLLT did not help an acute episode of cervical neck pain. It is not clear if multiple treatments would have helped Molly.

## SUMMARY

Low level laser therapy is an alternative to pharmaceutical intervention in veterinary medicine. Exact treatment protocols for veterinary applications have not been developed including, duration of treatment, appropriate wavelengths, and sites of application. Length of treatment will also have to be determined. Many dogs and cats move excessively while being resonated. Patient cooperation has to be addressed when evaluating the success of a low level energy program. Willingness and ability of owners to bring patients for frequent progress examinations will also be a factor.

Based on my experience with LLLT and the lack of side effects, there is enough evidence of potential benefit to warrant further study of low level energy for treatment of specific diseases in cats and dogs. Low level laser therapy is not the answer for every medical and surgical problem. There are cases in which LLLT did not appear to help the problem. Cost of treatment does not appear to be a factor. Clients are very ready and willing to use alternative approaches to traditional western methods.

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