

## Laser Therapy: Revolutionizing Pain Management and Wound Healing

As stated by Juanita J. Anders, PhD in the August 2010 issue of the ASLMS Journal, "The use of Photobiomodulation, commonly referred to as low level light therapy, to alter cellular function has come a long way since the early days." First, I may be a bit particular about terminology as there are a lot of misperceptions and misrepresentations out there. Due to years of inferior products and exaggerated claims, we need to be very specific and accurate with our statements. So this is not a discussion on "Light" therapy. This is "Laser" therapy. More specifically we are talking mainly about "high power Laser therapy." Although "cold" lasers or "low level lasers" work on the same principles, they often do not have enough power to elicit a measurable or consistent clinical response in deep musculoskeletal conditions. Laser therapy has been used in animals for over 20 years. However the newer high-powered Class IV therapy lasers were just FDA cleared in the US in 2005. Their use has grown dramatically in the last 3-5 years.

Let's start with the basics. The two most important parameters that dictate the function or capability of any Laser are its wavelength and its power. Wavelength is just the 'color' of the Laser light. Laser therapy works by a wavelength specific form of 'photobiomodulation'. Laser light in the red and near-infrared range is absorbed by specific structures in the body (cytochrome C oxidase/hemoglobin/water) and this has a positive effect on many biological reactions. The main result of this photochemical reaction is to increase blood flow to tissue, stimulate the release of O<sub>2</sub> from the hemoglobin delivered, and enhance the efficiency of converting the O<sub>2</sub> to useful energy within the cell. This will lead to improved cellular function and/or an increase in cell growth, replication, repair, or production of beneficial biochemical reactions. There are other physiologic responses to Laser light as well. There is a mild photothermal effect (With Class IV Lasers only!) which helps with blood flow, muscle relaxation, and nerve conduction. There is a photoenergetic effect which can stimulate acupuncture points. The clinical results of these cellular reactions are the following:

- Accelerated tissue repair and growth
- Faster wound healing
- Pain relief
- Decreased inflammation
- Improved blood flow
- Improved lymphatic drainage
- Improved nerve function and repair
- Decreased fibrosis
- Improved health of the immune system
- Acupuncture stimulation
- Trigger Point modulation

Laser power is the rate at which the Laser energy is delivered. Using a proper Laser that delivers enough light (photons) to the appropriate area is the key to consistent and measurable effects. The classification of all Lasers is dictated by the FDA and is based on the maximum power the Laser can deliver. It is used for guidance when discussing safety and the potential to cause harm/damage especially to the eye. Most therapeutic lasers are class IIIa, IIIb, or IV. Class IIIb lasers produce less than 500 mWatts of power. Class IV Lasers are anything that produces over 500 mWatts of power. Class IV therapy Lasers are extremely safe. The main benefit to the higher power is the ability to deliver enough photons at the

surface (a larger total dose) to compensate for the power loss (decreased number of photons) that will reach deeper tissues due to scatter and absorption within the tissue. This allows for a more direct photochemical response on these tissues. That is why there is a much more dramatic and consistent response to class IV Laser therapy vs class III Lasers or LEDs (Light Emitting Diodes). Lower dosages are used when treating small patients or superficial wounds/lesions and for acupuncture point or trigger point stimulation. Most Class IV Lasers have the capability to reduce the power in order to deliver a lower dosage when appropriate. This makes them very versatile and can be used effectively for superficial skin lesions as well as deep muscle or tendon conditions or conditions in the thorax or abdomen...and anywhere in between!

There is one other parameter that is important to optimize clinical results. That is the pulsing frequency or “strobe” effect of how the Laser is emitted. The pulse rate with which the Laser is being delivered will have differing physiologic effects on tissue. Lower pulse rates and continuous wave for example are better for pain modulation while higher frequencies are more anti-inflammatory. Different tissue types also seem to respond more efficiently to differing pulse rates. It may not only be as simple as the rate but even the amount of time the Laser is on vs off could affect tissue response in a more positive manner. These are still being studied but current literature consistently shows that adding some pulse frequencies (Modulating) to the treatment protocols produces better results overall than just Continuous Wave (CW) delivery. This is important especially in complex disease processes such as Interstitial Pulmonary Fibrosis (Westie Lung Disease) to get the most improvement.

The adjustability of the power (Dosage) and pulsing allows Laser therapy to be applied to a broad range of clinical applications for pain management, wound healing, reducing inflammation/swelling/edema, and rehabilitation across all species. Measurable positive results can be seen consistently in the following list of conditions:

- Arthritis (Hip dysplasia)
- Muscle, ligament, and tendon injuries (Sprains, strains, and tears)
- Ulcerations and open wounds (Lick granulomas, Hot Spots, Abscesses )
- Acute and Chronic Ear Problems
- Post-Surgical pain/healing/rehabilitation
- Trauma/Fractures
- Neck and Back Pain (Acute and chronic)
- Even some respiratory, bladder, and stomach/intestinal conditions

Laser therapy will benefit WLD by reducing the inflammatory process that leads to the progression of this disease. It will modulate the immune system to decrease the production of harmful by-products that cause the body to react negatively to normal cellular structures. It can reduce and remodel some of the abnormal collagen (Fibrosis) that is causing the decreased function and increased effort of normal breathing. It can decrease the amount and frequency of other medications that may have more potential for negative side-effects. The Laser effects can last for days or even weeks at a time which limits the number of treatments needed after the initial induction phase. Any Laser therapy will be beneficial as long as enough light (photons) reaches the lung tissue for a direct photochemical response. However, delivering the energy using a broader range of wavelengths and using a range of pulsing or modulating delivery modes will enhance clinical results even further. The level of improvement and length of clinical response will be better when the Laser parameters are optimal.

There are years of research related to the positive effects of Laser light. Its clinical benefits continue to expand as we are just starting to realize its full potential. Exciting new possibilities include help with

chronic upper respiratory and lower respiratory conditions such as Westie Lung Disease, insect/ snake bites, allergic reactions, chronic stomach or bladder inflammation, bacterial/viral infections, adjunct therapy to improve stem cell results and even potentially for the control/palliation of some tumors. There is optimism for neurologic trauma including concussions, brain ischemia and stroke, peripheral nerve damage, and other back and neck conditions.

A point worth emphasizing is that Laser therapy does not just accelerate healing it actually improves repair, regeneration and remodeling of tissue. Post-operative complications are reduced. Muscle weakness can be reversed. Type 1 collagen production leads to better tendon and ligament strength and elasticity. There is a positive effect on neurologic function. The joint capsule, synovial lining/fluid, and cartilage all benefit from Laser therapy. Therefore range-of-motion, function, flexibility and mobility are all enhanced. The potential for re-injury is greatly reduced. Performance animals not only recover quicker but they can regain their competitive edge. Pets can get back to their daily routines and become an active member of the family again.

These are exciting times. Like all technology, Lasers have become smaller, safer, more efficient and easier to use. Their broad range of applications makes them not just affordable but profitable. This is why therapeutic Lasers are rapidly becoming an indispensable tool used to improve the lives of thousands of patients both veterinary and human worldwide.