WHAT IS LASER PHOTOTHERAPY?

Laser Phototherapy (LPT), also commonly known as Low Level Laser Therapy (LLLT), cold or soft laser, or laser photobiomodulation, is a form of phototherapy which involves the application of monochromatic and coherent light to injuries and lesions to stimulate healing.

Laser therapy is used to increase the speed, quality and tensile strength of tissue repair, resolve inflammation, and give pain relief. Applications in internal medicine are also being investigated, and LPT shows great promise as a side-effect free method of treating many common disorders.

ADVANTAGES OVER OTHER MODES OF THERAPY

Laser therapy has been found to offer superior healing and pain relieving effects compared to other electrotherapeutic modalities, especially in the early stages of acute injuries, and for chronic problems. Low-level lasers can also be used for Acupuncture Point stimulation.

Laser therapy is a universal method of treating muscle, tendon, ligament, connective tissue, bone and skin tissue with one simple piece of equipment, however, excellent results are also achieved when it is used to complement other treatment modalities, such as ice for acute injuries, or shockwave, PRP, stem cells, etc., for chronic conditions. It is an ideal modality in large and small animal rehabilitation for both performance and companion animals. It is especially popular in the treatment of competition horses, racing greyhounds and agility dogs.

It’s an attractive form of treatment for performance animals due to the prospect of shorter recovery and lay-off times. Importantly for animal athletes, laser therapy is a non-invasive, drug-free modality that can be applied on competition day without risking disqualification by drug-vetting tests.

TREATABLE CONDITIONS

Low-Level Laser has been shown to be effective in, but not limited to, the treatment of the following indications:

**780-830nm + 904nm Infra-Red Wavelengths - Deep Tissue Penetration:**
- Sprains & strains
- Wounds and abrasions
- Haematomas
- Ligament & tendon injuries, bowed tendon
- Acute & chronic inflammation
- Joint injuries
- Myofascial trigger points, pain points and deep-tissue acupuncture points
- Acute & chronic pain
- Non-union & small-bone fractures

**630-700nm Visible Red Wavelengths - Shallow Tissue Penetration:**
- Wounds & abrasions
- Superficial acupuncture points
- Mucous membranes
- Post-surgical wounds

HOW DOES IT WORK?

The effects of all light and laser therapies are primarily photochemical, not thermal (at least, not on a macro-scale), and result from a chain of mechanisms initiated by photon absorption:

- **Primary:** Absorption of photons by photo-receptive molecules (e.g. cytochromes, porphyrins, etc.) and the transduction of photon energy to induce chemical changes (i.e., photochemistry)
- **Secondary:** Modulation of ATP production (dose dependent), Nitric Oxide release, and the formation of Reactive Oxygen Species (ROS);
- **Tertiary:** The products of secondary mechanisms then produce effects such as gene transcription, inter-cellular signaling, and vasodilation; and,
- **Quaternary:** Vasodilation increases perfusion, facilitating improved oxygenation and recruitment of macrophages, neutrophils and lymphocytes to areas undergoing repair and/or infection as well as further re-vascularization and proliferation of cells to aid healing. Improved perfusion will also facilitate clearance of inflammatory cells, fluids and debris (i.e. lymphatic drainage) more efficiently.
A number of the effects of laser irradiation, however, are unique, and are due to the speckle field that is created when coherent laser radiation is reflected, refracted and scattered. The speckle field is not simply a
phenomenon created at and limited to the tissue surface, however the depth within the tissue at which speckles can still be created from transdermal irradiation is a topic of some debate.

Laser speckles formed in the tissue create temperature and pressure gradients across cell membranes, increasing the rate of diffusion across those membranes. Further, photons within each speckle are highly polarised, leading to an increased probability of photon absorption (one possible reason for why laser therapy has been shown to consistently out-perform other non-coherent light sources, especially for deeper tissue treatments).

**HOW, AND HOW OFTEN, SHOULD I TREAT?**

The design of a laser therapy regimen for any injury or ailment should be approached from the perspective of the desired clinical outcome at the end of a course of treatments and, more specifically, the outcome of each individual treatment session.

The latter will largely determine the appropriate selection of each of the various treatment parameters, e.g., power density, irradiation time, treatment technique, etc. The former will largely determine the frequency of treatments - although this is also influenced by the progress of the patient toward the desired outcome - and will take into account the effects of the various mechanisms of action and the condition of the tissues that are to be irradiated.

Let's take, for example, an acute musculoskeletal injury, indicated by pain and inflammation due to soft tissue damage. The primary desired outcome of the initial stage of treatment is pain attenuation, and one quite effective mechanism involves an inhibitory 'nerve block' effect. For chronic pain, it has been shown that treatment should be repeated every two days because the effect only lasts for about 48 hours.

For acute pain, however, one could treat even more frequently - even multiple times per day - although it should be noted that the underlying injured tissue within the irradiated area might be over-treated by this regimen if it were to be maintained beyond the first few days post-injury. Once the pain is at a bearable level, usually after 2-3 days, treatment frequency can be reduced to daily, as the primary desired outcome during this period is now the reduction of inflammation and its related pain.

As soon as the inflammation is under control, healing of the injured tissues can begin. The cells of injured tissue are more sensitive to exposure to light than are the cells of intact tissue, and so irradiation that is repeated too frequently can lead to an accumulation of effects in the local tissues and, therefore, an over-stimulation that subsequently leads to bio-inhibition (per the oft-referred Arndt-Shultz curve).

The dose should be reduced by approximately 30% at this point, and I would further suggest that the frequency of treatment should also be reduced, perhaps initially to once every 2-3 days for a week or two, then every 3-4 days for another week or two, and then once a week throughout rehabilitation.

If the patient suffers a flare-up in symptomatic pain and/or inflammation in the injured area as they progress through their rehabilitation and return to full function, as is often the case when someone over-exerts themselves during their rehab exercises, treatment frequency can be temporarily increased as the condition can again be considered acute - albeit usually at a lesser severity than the original injury.

It should be noted that what I have presented as distinct steps in the treatment process, e.g., pain attenuation --> inflammation reduction --> tissue healing, will actually produce a continuum of activity. For instance, during the initial period of treatment, which involves irradiating multiple times per day to optimize pain attenuation, there will also be some effect of that irradiation upon inflammation. And, as inflammation resolves, healing will begin even before this becomes the primary targeted outcome.

As this is obviously an imprecise process, the outcome of each treatment session and the patient's overall progress should be continuously monitored and the treatment plan adjusted accordingly. For this very reason, SpectraVET prefers not to provide 'cookie-cutter' protocols for users to follow. Instead, we provide you with the tools and knowledge required to assess and treat every patient according to their specific needs at each treatment session. That said, however, included with your SpectraVET PRO are a few example protocols for you to use as a guide to developing your own.