

Therapy Lasers: Too Good to be True?

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First, I am particular about the terminology of laser therapy as there are many misperceptions and misrepresentations. After years of inferior products and exaggerated claims, we must be specific and accurate with our statements.

So this is not a discussion of "light" therapy but "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.

Newer high-powered Class IV therapy lasers were FDA cleared in the U.S. in 2005. Their use has grown dramatically in the past two years.

The two key parameters that dictate the function or capability of any laser are wavelength and power. Laser therapy works by a wavelength-specific form of photobiomodulation.

Laser light in the red and near-infrared range is absorbed by specific chromophores in the body (cytochrome C oxidase/hemoglobin/water) and this has a positive effect on specific biological reactions. This photochemical reaction increases blood flow to tissue, stimulates the release of O₂ from the hemoglobin delivered and enhances the conversion of O₂ to useful energy by cytochrome C oxidase in the production of ATP.

This leads to improved cellular function and/or an increase in cell growth, replication, repair or production of beneficial biochemical compounds—enzymes, proteins, immunoglobulins, DNA/RNA.

There are other physiologic responses to laser light: A mild photothermal effect (with Class IV lasers only) helps with vasodilation, muscle relaxation and nerve conduction. The photoenergetic effect can stimulate acupuncture points, and the photoelectrical effect can affect membrane-bound ion channels and induce changes in the intracellular and extracellular ion gradients.

The clinical results of these cellular reactions are:

- Accelerated tissue repair and growth
- Faster wound healing
- Analgesia
- Decreased inflammation
- Angiogenesis
- Vasodilation
- Improved lymphatic drainage
- Improved nerve function, axonal regeneration, neurologic repair
- Decreased fibrosis
- Immunoregulation/Immunomodulation
- Acupuncture stimulation
- Trigger point modulation

Laser power is the rate at which the laser energy is delivered. Although seemingly straightforward, the power question seems to raise the most discussion regarding appropriate parameters. The physics associated with laser penetration within non-pigmented tissue is well established and quantified by the rate of decay of an incident beam as it moves through tissue.

It can be approximated by the optical penetration depth of a given wavelength—the distance into tissue to which photons of that wavelength will travel where the incident beam is decreased by 63 percent. The power argument is almost exclusively associated with therapeutic lasers; all other types—surgical, aesthetic, dental, industrial—follow the basic science and physics when determining proper power guidelines for use.

The FDA classifies lasers based on the maximum power the laser can deliver. The maximum power is used for guidance when discussing safety and the potential to cause harm or damage, especially to the eye.

Most therapeutic lasers are class IIIa, IIIb or IV. Class IIIb lasers produce < 500 mW of power (1/2 watt). Class IV lasers are anything over 500mW of power. Class IV therapy lasers are extremely safe. The main benefit of 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) reaching deeper tissues.

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 than class III lasers or light emitting diodes, or LEDs. Lower dosages are used when treating superficial wounds or lesions and for acupuncture point or trigger point stimulation. Adjustable power output can make a Class IV laser effective for superficial dermatologic lesions, deep musculoskeletal conditions and anywhere in between.

Laser therapy has broad clinical applications for pain management, wound healing, reducing inflammation/swelling/edema, and rehab in both large and small animals. Measurable positive results are seen consistently in the following conditions:

- Arthritis/DJD (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, rehab
- Trauma and fractures
- Neck and back pain (acute and chronic)
- Neuromuscular disease, damage, degeneration
- Even some respiratory, urinary and gastrointestinal conditions

Notwithstanding years of research on the biostimulatory effects of laser light, we are just starting to realize all the clinical applications.

Exciting new possibilities include help with osteochondrosis dissecans, chronic rhinitis/bronchitis, insect and snake bites, allergic reactions, chronic intestinal or urinary tract inflammation, bacterial/viral infections, adjunct therapy to improve stem cell results and even potentially for the control or palliation of some tumors.

There is also optimism for neurologic trauma including concussions, brain ischemia and stroke, peripheral nerve damage, IVDD and stenosis.

It's worth emphasizing that laser therapy does not just accelerate healing; it actually improves repair, regeneration and remodeling of tissue.

Post-op complications are reduced. Muscle atrophy can be reversed. Type 1 collagen production yields better tendon and ligament strength and elasticity. There is a positive effect on neurologic function and axonal sprouting. The joint capsule, synovial lining and fluid, and cartilage all benefit. 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 active members of the family again.

These are exciting times. As with 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—especially when treatments are delegated to the support staff.

It's no wonder that therapeutic lasers are rapidly becoming indispensable tools in thousands of clinics.

This Education Series article was underwritten by K-Laser USA of Franklin, Tenn.