

L HEAT S METAL and GROWTH PLATES S

by Phil Harrington, DC, CMLSO, FASLMS



Therapy lasers have become a “go-to” modality for many chiropractors across the country. The powerful combination of clinical efficacy, lack of harmful side effects and return on investment means that therapeutic lasers will be a popular treatment modality for years to come. Not long ago, laser therapy was perceived as voodoo. But today the mechanism of action is understood; cellular targets and physiological effects identified; and a solid track record of clinical efficacy for various conditions is emerging.

From a scientific standpoint, there are topics of which some is known, but further research is required. Parameters such as ideal power and power density, wavelength and combinations of wavelengths, dosage at skin surface and at depth, as well as pulsed frequencies must be studied in vitro, in vivo (in both animal and human subjects), and in clinical trials. Advancing the knowledge base will optimize laser therapy treatments so we can give our patients the very best care possible.

Many of those lecturing on laser therapy in the chiropractic world claim expertise by quoting the number of years they have used lasers, touting conjured techniques, and reciting jargon largely fed to them by the marketing department of a therapy laser company. While these tactics may have served to successfully introduce laser therapy to our health care profession, they must be set aside for a more rigorous scientific discussion.

Like it or not, a certain knowledge of basic physics is required to have a rudimentary understanding of the modality. And an advanced knowledge of physics should be required for those lecturing and writing on the topic. Full credit should be given to those with advanced degrees in orthopedics, sports injuries, etc., but this author has observed a large number of basic science mistakes in those doctors’ writing and presentations.

To advance laser therapy as a modality, as well as preserving and gaining credibility for our chiroprac-

tic profession as a whole, scientifically correct terminology and concepts must be utilized.

This article will address tissue heating and laser therapy over metal implants and growth plates.

Primum non nocere — First, do no harm. The worst-case scenario must be utilized in any examination of safety. For a therapy laser, this would mean testing the highest power available in continuous wave mode (light constantly “on”). For this test, the author used a class 4 therapy laser capable of producing 15 Watts maximum power at wavelengths (colors) of 800, 905, and 970 nanometers (nm) individually, or in any combination.

These wavelengths are in the near-infrared (NIR) region of the electromagnetic spectrum and are non-ionizing. NIR photons have much lower energy than ultraviolet or x-rays, and cannot break molecular bonds nor cause genetic damage.

There is a small peak in the absorp-

tion curve for the water molecule at 970nm. When water molecules absorb photons of light, the light energy is converted into heat, so using the 970nm wavelength alone will produce the most tissue heating.

As infrared therapy laser light penetrates into the skin and is absorbed, it attenuates and gets dimmer. This means that any tissue heating will occur from the outside-in, the skin will be warmer than any tissues deep in the body. Laser therapy is not a deep heating modality.

A therapy laser producing 15 W, CW at 970nm was run for several minutes on a human forearm. The skin temperature of the treated area was measured using a Fluke 62 Max infrared thermometer¹. This test was run for four minutes, delivering 3600 Joules to an area of 200 square centimeters, a dosage of 18 J/cm².

Human core body temperature in a normal healthy adult is 98.6°, but ambient skin temperature is several degrees less. In our study, the starting forearm skin temperature was 95°. During the four minutes exposure, the maximum measured skin temperature was 99°. The subject's forearm was allowed to cool, then was exposed to direct sunlight on a summer day in Franklin, TN. After four minutes exposure, the skin temperature had increased to 102°.

Two implications of this are that even at very high power levels, therapy laser treatments are extremely safe, warming the tissues less than during a walk on a sunny day; and that no appreciable heating is occurring deep inside the body.

Decades ago, infrared heat lamps were contraindicated for usage over open growth plates, due to concerns of early closure induced by the deep heating. After high

powered therapy lasers were FDA cleared in 2003, many (including the author) cautioned against treating over open growth plates. Now that we better understand the mechanisms of action, combined with knowledge that even the highest



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powered therapy lasers are not creating significant heating inside the growth plates, those cautions can now be dismissed.

A study² by Cheetham examined the radiological and histological effects of high doses of NIR therapy laser on healthy growth plates in Wistar rats. It concluded the laser “had no significant effect on the healthy growth plates of the rat knee joint.” In addition, in more than ten years clinical treatment of both human and animal juvenile patients, not a single incident of early growth plate closure or any other problem has been reported.

Chiropractors wanting to use laser therapy to treat teenage patients suffering from Osgood-Schlatter's, back pain, scoliosis or other conditions can proceed with the assurance that laser therapy will not have a harmful effect on the patient's growth plates.

Another frequent question is the use of therapy laser over metal implants in the body. Therapeutic laser light is reflected, not absorbed by metal surfaces, so no heat is generated when laser therapy is used over joint replacements, plates from broken bones, or even post-surgical metal clips.

Patients with metal implants frequently have a buildup of scar tissue resulting in reduced range of motion, chronic pain and reduced mobility. Therapeutic ultrasound cannot be used over the metal, but laser therapy can, and in combination with soft tissue mobilization the chronic scar tissue can be effectively broken up, range of motion improved and mobility restored.

Therapeutic lasers are here to stay. As further studies are conducted, equipment is refined and protocols are enhanced, clinical effectiveness will

improve and return on investment will grow. Chiropractors using laser therapy can be assured the treatments can safely be used over open growth plates and metal implants.

1 <http://www.fluke.com/fluke/m2en/Electrical-Testers/Thermometers/Fluke-62-MAX-Plus.htm?PID=74272>

2 M. J. Cheetham, S.R. Young and M. Dyson: 'Histological Effects of 820 nm Laser Irradiation on the Healthy Growth Plate of the Rat' *Low Level Laser Therapy* 1992; 2: 59.

About The Author — Phil Harrington, DC, CMLSO, FASLMS holds a BS degree in Physics (Iowa State University), graduated Palmer College of Chiropractic in 1996 and practiced in Iowa for ten years. He is a Certified Medical Laser Safety Officer and has lectured nationally and internationally on laser therapy to both human and animal health care practitioners. Visit www.k-laserusa.com. To contact the author, email him at pharrington@k-laserusa.com.