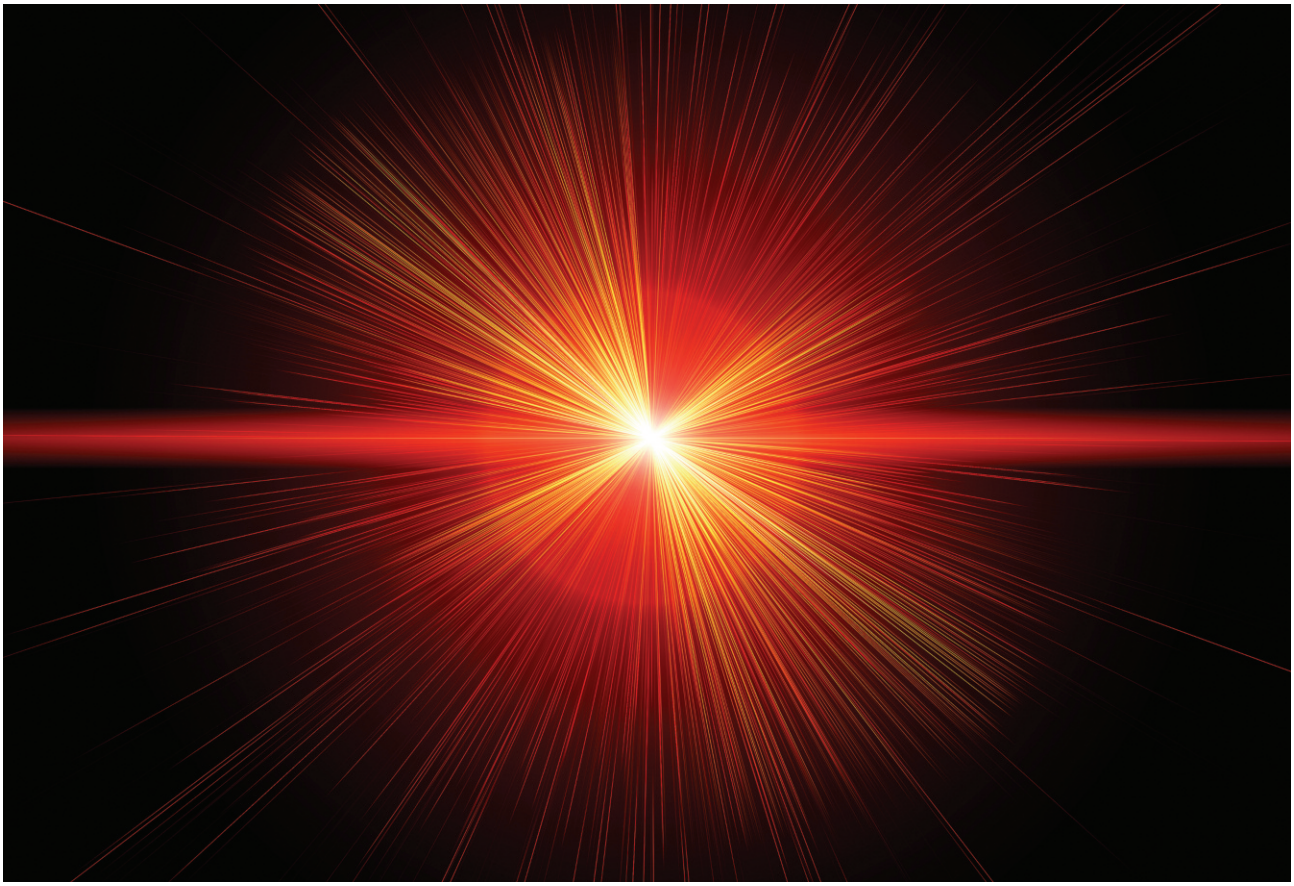


ADOBE STOCK

Shining a light

It's time to dispel these six laser myths.

BY ROB BERMAN

LASERS HAVE EVOLVED AND IMPROVED OVER THE LAST FEW decades. They have expanded from "hot" surgical lasers such as CO_2 designed to cut tissue, to the therapeutic lasers used in many chiropractic clinics around the country. However, there are still many myths about what a laser is, how a laser works, and how much energy is needed to induce biological effects to relieve pain, reduce inflammation, and initiate tissue repair. Below we examine six of those myths.

1. There is only one wavelength that is therapeutic

False. Various laser companies and their representatives often tout their lasers as having the magical wavelength. Why? Because those are the wavelengths the company offers. Many studies, books, and research papers have shown there is a therapeutic window where lasers are effective, frequently described as being between approximately 600 nanometers and 1,200 nanometers.

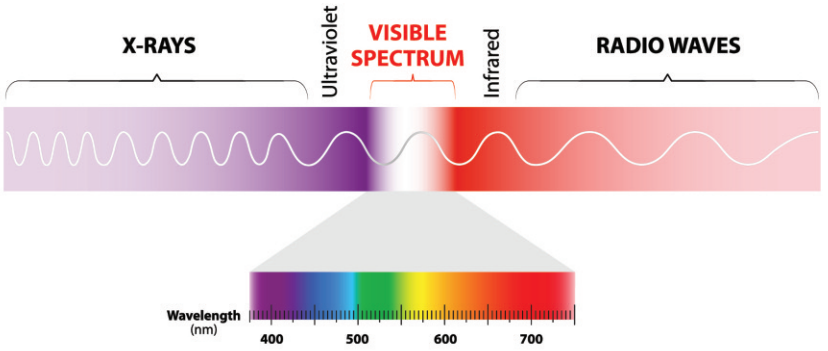
That range allows for many wavelengths that can perform therapeutic functions. Wavelength selection should be governed by what the practitioner is attempting to accomplish, such as reaching deep-seated pathologies like facets and discs, or more surface applications such as laser acupuncture. Many lasers have both visible (usually red) and infrared wavelengths. The infrared wavelengths tend to penetrate deeper than wavelengths that the eye can see.

2. Laser wavelengths must be between 390 nm and 761 nm

False. Those wavelengths are part of the visible light spectrum. The word "laser" is an acronym formed from "light amplification by the stimulated emission of radiation." The first word of the acronym, "light," does not specify it must be visible. Indeed, a well-known definition of "laser" is: "Any device that can be made to produce or amplify electromagnetic radiation in the wavelength range from 180 nm to 1 mm primarily by the process of controlled stimulated emission."[1]

Notice the range given is from 180 nm to 1 mm (1,000,000 nm). There are thousands of studies available from sources such as PubMed validating the effectiveness of lasers. Quite a few of

Visible and invisible light



them involve lasers above 761 nm. Many include those from 800 nm to 1064 nm. For example, the previously mentioned CO_2 laser operates at 10,600 nm, and is used routinely in surgical procedures.

3. All it takes is one photon to heal

False. Photons do not behave like ping pong balls in motion. The concept that one photon entering the body bumps into other photons and so on is simply false. Lasers fire hundreds of millions of photons each second. To create adenosine triphosphate (ATP) to heal tissues, you need to trigger the protein pump. And the cellular enzyme cytochrome c oxidase readily splits into hydrogen and oxygen as fuel for cells when stimulated by laser.[2]

4. Infrared lasers must be 'hot'

False. Super-pulsed lasers fire pulses in nanoseconds compared to the milliseconds in which continuous-wave lasers fire. The rapid pulsing dissipates or diminishes thermal effects so efficiently that you can place a super-pulsed treatment head on a patient and leave it in place as if it were an actual "cold" laser.

Additionally, low power continuous-wave lasers in the infrared spectrum do not necessarily produce significant heat. Given their low milliwatts of power, even with a small aperture size, the energy density cannot get high enough to produce a thermal effect.

5. Light therapy is the same as laser therapy

False. A light source that is not collimated will not penetrate deeply into the body. A light-emitting diode or LED is a type of semiconductor light source with properties between those of an incandescent light bulb and laser.[3] LED light cannot achieve the same level of penetration into the body as a laser for pain relief, inflammation reduction, and tissue repair.

6. Cells can be injured by higher energy density

False. The work on the Arndt-Schulz law was done only on open wounds.[4] "Inhibition" is cited by some laser manufacturers as the reason why higher energy or certain wavelength lasers should not be used. The specific narrow finding has been extrapolated to all conditions that lasers treat. Low power density is recommended for open wounds because layers of the skin are missing. Typically, the layers of the dermis and epidermis absorb about 66 percent of laser energy.

Tiina Karu, PhD in her book *Ten Lectures On Basic Science of Laser Phototherapy* disproved the notion that once the point of inhibition is reached, more energy density (dose) is harmful. She found at certain levels of dose that there was inhibition, but as the dose is increased the inhibition goes away and cells thrive more. Her findings are that the Arndt-Schulz law needed to be updated because there were a number of peaks and valleys. The cover of her book actually shows the updated Arndt-Schulz law with the peaks and valleys.[5]

To conclude, there are many myths about laser therapy or photobiomodulation, and this article touched on only six. Before you employ a therapy laser in your practice, understand how, when, and why to utilize a laser to obtain best results. CE

ROB BERMAN is a partner at Berman Partners LLC, a medical device sale, service, and marketing company. Berman Partners specializes in new and preowned therapeutic lasers. He can be contacted at 860-707-4220, rob@bermanpartners.com, or through bermanpartners.com.

References

[1] International Electrotechnical Commission. (2012). *International Standard IEC 60601-1: Medical electrical equipment.* ISBN 978-2-8322-0331-6.

[2] Albuquerque-Pontes GM, Vieira RP, Tomazoni SS, et al. Effect of pre-irradiation with different doses, wavelengths, and application intervals of low-level laser therapy on cytochrome c oxidase activity in intact skeletal muscle of rats. *Lasers Med Sci.* 2015;30(1):59-66. doi: 10.1007/s10103-014-1616-2.

[3] "Comparing LASERS and LEDs for use in Cold Laser Equipment." ColdLasers.org. http://www.coldlasers.org/therapy/laser-vs-led. Updated Sept. 2016. Accessed Sept. 2016.

[4] Hode L, Tuner J. (2014). *Laser Phototherapy Clinical Practice and Scientific Background.* Sweden: Prima Books.

[5] Karu, T. (2007). *Ten Lectures on Basic Science of Laser Phototherapy.* Sweden: Prima Books.