Multi Radiance Medical/Veterinary Super Pulsed Lasers:

A Scientific Evidence-Based Technology Yielding Consistent Clinical Results

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Description/Definition:

The Multi Radiance MR5 ACTIVet Pro Super Pulsed Infrared Gallium Arsenide (905nm) laser emits a very high peak power, 50W, in billionth-of-a-second pulses that range from 100 to 200 nanoseconds. To put this in perspective, ~~a~~ billionths of ~~a~~ seconds are to a second as one minute is to 31.07 years!!! This extremely short, intense light pulse happens so quickly that there isn't any thermal influence on the skin or damaging heat buildup within the targeted tissues. This allows a long-on-contact treatment technique and increased energy penetration depth, resulting in a more thorough saturation of the target tissues. (Joensen, J. 2011)

Continuous vs Pulsed vs Super Pulsed Emissions

Lasers that emit continuously emit one wavelength all the time at whatever power it is set.: for example, 810 nm wavelength set to emit at 10 W has an average power output of 10W all the time. Continuous-wave lasers that are "pulsed" do not emit a high short peak of power, but rather, the continuous beam is chopped mechanically by turning the laser on and off. The same 810 nm laser emitting 10 W continuously in pulsed mode would emit 10 W but only half of the time (50% duty cycle), resulting in an average power output of 5 W. Delivery of photonic energy utilizing either of these modes of emission creates a buildup of heat in the tissues that will result in photothermal damage to the tissue instead of the desired phototherapeutic stimulation of the tissues through the biochemical cascade of events within the cells inherent with photobiomodulation. (Paschotta, R. 2016; Hashmi, J.T. 2010; Berger, N.A. and Egg P.H. 2006)

Benefits of Applying Combinations of Super Pulsed and Light-Emitting Diode Emissions

The Multi Radiance line of lasers emits a combination of clinically proven super pulsed, red, **blue** and broadband infrared wavelengths. The proprietary software algorithm synchronizes the emission of these multiple wavelengths to create a cascading effect of photonic energy absorbed by the superficial structures, those structures that are deeper, and finally, the super pulsed wavelength to penetrate even deeper. (Ernesto Cesar Pinto Leal-Junior, *et al*. 2014)

Photobiomodulation Therapy Combined with a Static Magnetic Field has a Synergistic Acceleration of Cellular Electron Transfer

Multi-radiance lasers emit photonic energy within a static low-intensity magnetic field. The magnetic field amplifies the effect of the short, intense laser pulse excitation of an endogenous Type I photosensitizer via a singlet-triplet transition. The short, intense, super-pulsed laser energy excites the photosensitizer to a higher energy state for a short period of time but soon decays back to the ground state. The magnetic field causes the photosensitizer to remain in an excited state for a longer time, allowing electron transfer to occur without replacing one excited (singlet) state with another excited (triplet) state. This photo-magnetic synergy, which enhances electron transfer, activates the respiratory chain, increasing ATP production and cell proliferation. (Ribeiro, N.F. *et al* 2023; Pinto H.D. *et al.* 2022)

References:

1. Joensen J. *et al* .(2011) The Thermal Effects of Therapeutic Lasers with 810 and 904 nm Wavelengths on Human Skin. *Photomedicine and Laser Surgery*. **29**(3): 2011Pp. 145-153.
2. Paschotta, R. (2016) Modes of laser operation. Available from: https://www.rp-photonics.com/modes_of_laser_operation.html (accessed August 17th 2024.)
3. Hashmi J.T. *et al*. (2010) Effect of pulsing in low-level light therapy. *Lasers Surg. Med.* **42**(6):450-466.
4. Berger, N.A. and Egg P.H. (2006) *General principles. In: Veterinary Laser Surgery: A Practical Guide*. P. 17. Wiley-Blackwell, Hoboken, NJ
5. Ernesto Cesar Pinto Leal-Junior, *et al*. (2014) Adjunctive use of combination of super-pulsed laser and light-emitting diodes phototherapy on nonspecific knee pain: double-blinded randomized placebo-controlled trial. *Lasers Med. Sci*. **29**:1839-1847.
6. Ribeiro N.F. *et al.* (2023) Photobiomodulation therapy combined with static magnetic field is better than placebo in patients with fibromyalgia: a randomized placebo-controlled trial. *Phys Rehab Med* Dec. **59**(6):754-762.
7. Pinto H.D. *et al.* (2022) Photobiomodulation Therapy Combined with a Static Magnetic Field Applied in Different Moments Enhances Performance and Accelerates Muscle Recovery in CrossFit Athletes: A Randomized, Triple-Blind, Placebo-Controlled Crossover Trial. *Oxid Med Cell*. 9968428