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Understanding Science of Laser Therapy

By Dennis Arp
Contributing Editor

Ronald Riegel, DVM, has long worked to educate colleagues and dispel myths about laser technology, taking on culprits that include an icon of popular culture.

The name is Bond. James Bond.

Fears have lingered since the days when 007 was trying to avoid being sliced in half by an industrial laser in the 1964 film "Goldfinger," Dr. Riegel says.

"Even these days, practitioners feel that warmth and worry that too much use of a therapeutic laser will damage cells," says Riegel, who practiced for 22 years. His seven books include manuals on laser use.

"Then they learn that what they're feeling is a photochemical reaction, not a photothermal one, and the light goes on, no pun intended."

Most veterinary practitioners now have at least a cursory knowledge of Class IV laser therapy and its effectiveness in relieving pain, reducing inflammation and accelerating healing, Riegel says.

"The goal … is to obtain a device that provides the deepest penetration and the greatest amount of photobiostimulation in a reasonable amount of time," he writes in his paper "Scientific Facts Concerning Class IV Laser Therapy in Veterinary Medicine."

"The most common reason for treatment failure is low power and dosage, short wavelengths and nonscientific treatment protocols," adds Riegel, who consults for LiteCure, a maker of Class IV therapy lasers for veterinary use.

"Unfortunately, some manufacturers have 'created' therapy protocols to fit pre-existing equipment, rather than using scientific facts and clinical results to guide in the design of their laser product."

PHOTOS COURTESY OF DR. ROBIN DOWNING

Michael Hernandez, director of technical services at The Downing Center for Animal Pain Management in Windsor, Colo., administers laser therapy to Freckles. Below, Hernandez treats the proximal quadriceps.

Recipe for Success

The key to a successful therapeutic dose of laser energy is achieving the right combination of power, wavelength and time, say Riegel and others with extensive experience accessing the medical benefits of the technology.

A therapeutic dose of energy is measured in Joules delivered per centimeter squared. The World Assn. of Laser Therapy has established that target tissues need a dose of 5 to 10 Joules per centimeter squared to get a biological response in cells, Riegel says.

Wavelength is important because it dictates the depth of penetration, says John Godbold, DVM, one of the first veterinarians to use Class IV laser therapy. He owns Stonehaven Park Veterinary Hospital in Jackson, Tenn.

Basically, the longer the waves, the deeper the penetration and the greater the opportunity for photobiostimulation of cells.

"Power is every bit as important as wavelength because it determines the amount of energy being delivered," Dr. Godbold notes.

A therapeutic laser needs 6 to 10 watts of power to be practical for clinical use, Drs. Godbold and Riegel say.

Godbold uses the example of a 60-pound arthritic dog with multiple joint involvement. Treating the patient with a 6-watt laser at maximum power and continuous

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>
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wave, the treatment would need to last eight to 10 minutes to reach an effective dose of eight to 10 Joules per centimeter squared.

To achieve the same target dose with a 1-watt laser would take 48 minutes to an hour, Godbold notes.

"Because the effects of the laser are cumulative, I'm convinced you could get the same results (with a less-powerful therapeutic laser)," he adds. "But is it practical to spend an hour in a clinical situation? It's really not."

Pulsing Lasers

Opting for the continuous-wave mode also increases the efficiency of the therapeutic laser, says Robin Downing, DVM, Dipl. AAPM, CVA, CCRP.

When the laser is set to the pulse mode, photons are emitted in short bursts, with slack periods in between. There's a 50 percent decrease in energy delivered, says Dr. Riegel.

Even superpulsing lasers with a peak power of 20 to 30 watts are "actually delivering energy a very small percentage of the time," Dr. Riegel writes.

"An analogy is putting a kink in a water hose. Let go of the kink and the flow rate increases temporarily. However the overall amount of water is not increased."

"We find that continuous wave is the fastest way to achieve the total dose desired," says Dr. Downing, who owns The Downing Center for Animal Pain Management in Windsor, Colo.

Godbold agrees but acknowledges, "Not everyone who has been intentionally involved with the technology is as convinced as I am that we get as good a response in patients with high-wattage continuous wave vs. multiple-frequency protocols.

"A number of us are pressing for treatment software based on target dose rather than frequency. To me, that's the logical evolution."

Not Difficult to Use

For now, simple math can determine the optimal dose of laser therapy, based on the area to be treated, the depth and density of the tissue and the number of Joules per second being emitted, experts say. Even coat and skin can be considerations, since dark hair and skin tone can absorb light energy, Downing notes.

But practitioners shouldn't be paralyzed by the inexact nature of applying laser therapy, experts say.

"There are no side effects, so there is really no risk of overtreating," Riegel says. "In many cases we've found that we were not treating aggressively enough.

"We need to use enough energy to increase the respiratory rate of cells and put them into hyperdrive. We're dealing with cells that are already injured, and we're looking to initiate this whole biochemical cascade of events."

When knowledge about the science behind the therapeutic laser combines with the clinical experience of seeing it relieve pain and restore mobility, trepidation often morphs into belief, practitioners say.

"I was the skeptic, and I took a lot of persuading," Riegel notes. "Basically, through research and experience, I figured out what worked and what didn't."

A great agent of change is seeing post-op patients heal faster or chronic arthritic patients move with ease for the first time in years, Godbold says.

He adds that with protocols in place, he enjoys having technicians administer the therapy.

"They are the ones in whose hands the healing takes place," he notes. "And that generates incredible excitement." ●