Laser Therapy: A Paradigm in Veterinary Practice

Ronald J. Riegel D.V.M., FASLMS, VMSO

“Thank you”

The American Institute of Medical Laser Applications
AIMLA
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Scientific Evidenced Based Medicine

What does laser therapy actually accomplish?

• First appeared in the late 1970’s
• Started with 1 mW to 10, 20 mW to 500 mW by late 1990’s
• Inconsistent results due to very low dosages and lack of technology
• Accelerated wound healing superficially but little else

Therefore an acceleration of the healing process

New technology

Regenerative medicine

History of Lasers in Veterinary Practice

ASLMS Meetings 4/2-6/2014: 2 1/2 days on photobiomodulation
NAALT/WALT Joint Conferences: Sept. 8 – 12, 2014: All PBM

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www.pubmed.com

Research evidence and clinical evidence is Evidence Based Healthcare

Ronald J. Riegel D.V.M., FASLMS, VMSO
"The application of electromagnetic radiation within the red and infrared spectrum over injuries and lesions to stimulate healing and pain relief within those tissues"

"Photobioregeneration"

Stem cells and PRP therapy

Lasers are classified by potential danger to the eye.

Class 1
Safe

Class 1M
Safe provided optical instruments are not used**

**Optical instruments - binoculars, telescopes, microscopes, magnifying glasses (but not prescription glasses)

Class 2
These are visible lasers. This class is safe for accidental viewing under all operating conditions. However, it may not be safe for a person who deliberately stares into the laser beam for longer than 0.25 s, by overcoming their natural aversion response to the very bright light.

Class 2M
Hazardous (even for accidental viewing) when viewed with the aid of optical instruments

Class 3
(1 mw – 500 mw)

Class 3R
(1 - 5mW)
Radiation in this class is considered low risk, but potentially hazardous.

OSHA requires all Class 3 and Class 4 therapeutic lasers users to wear protective eyewear

Class 3B
(5 - 500mW)
Radiation in this class is very likely to be dangerous.

Class 4
(500 mW+)

Surgical
(CO2 and diode)

Therapeutic lasers
Radiation in this class is hazardous, and viewing of the diffuse reflection may be dangerous.

Protective eyewear required
Penetration

How deep does a therapeutic dose penetrate?

Penetration Parameters

- Penetration depth
- Absorption
- The number of photons at that depth to saturate the tissues
- Joules/cm²
- Appropriate number of treatments
- Proper application technique

Wavelength

For effective penetration, the wavelength needs to avoid scattering, surface absorption and absorption by unwanted chromophores.

This is called the therapeutic window

Examples:
- Hemoglobin
- Melanin
- Water

Wavelength (Microns)

Absorption Coefficient

540nm

630nm

Depth of penetration is determined by the length of the wavelength
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Power

Both at 980nm wavelength
5 Watts
10 Watts

Power determines the number of photons at that depth.

Variations of power and wavelength:
- 5 Watts at 980nm
- 10 Watts at 980nm

Wavelength 980nm

Emission

980/808nm Contact

Continuous wave (CW)
Modulated continuous wave
Super pulsing

Frequency is expressed in Hertz (Hz)

- The terms pulsing and frequency are used interchangeably to describe the same concept.
- The number of cycles per second that a waveform repeats.
- 5 cycles per second = 5Hz

Emission of SuperPulsed Laser:
- Average Power Output: ~70mW
- Energy delivered per minute: ~4.2J
- Laser Classification: 1 to 3B
- Only feasible for the treatment of small areas
- Peak (instant power): ~25W

Average Power Output: ~70mW
Energy delivered per minute: ~4.2J
Laser Classification: 1 to 3B
Only feasible for the treatment of small areas
Peak (instant power): ~25W
Pulsing/Frequency

Pulsing mode = “X” Hz
Laser is emitting intermittently and only 50% of the time.

Emission Illustration

A laser emitting in a CW mode will saturate the tissue with photons faster than a laser emitting in a pulsed mode.

Pulsing should be considered:
when treating over an open wound or an extremely painful sensitive area.

Administration in the pulsed or continuous mode have yielded similar results in the literature. However, CW resulted in more tissue saturation.

Amount of Time to Deliver 3,000 Joules

<table>
<thead>
<tr>
<th>Treatment Area: 300 cm²</th>
<th>Dosage: 10 J/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total energy delivered: 3,000 J</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laser</th>
<th>5mW</th>
<th>10,000 minutes</th>
<th>166.7 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>500mW/laser</td>
<td>100 minutes</td>
<td>1 hour 40 minutes</td>
<td></td>
</tr>
<tr>
<td>3W laser</td>
<td>16.7 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10W laser</td>
<td>9 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continuous wave emission

Part Two: Laser/Tissue Interaction

Laser emitting at 10W:
50% Duty cycle:
5 Joules/sec. = 300 Joules/min.
Therapy time = 10 minutes

Laser emitting at 25W in a super pulsed mode:
4.2 Joules/minute
Therapy time = 714.28 minutes
Therapy time = 11.9 hours

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**Photothermal**
- Long pulses, biological effect due to heating - hair removal, surgical lasers

**Photomechanical (Photoacoustic)**
- Short pulsed (q-switched) lasers cause ablation - tattoo removal, photorefractive keratectomy

**Photobiochemical**
- Laser causes biochemical change or response - pain reduction, photodynamic therapy (PDT)

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**Cellular Attraction to Infrared Light**
- Fibroblasts, 3T3 cell cultures 800 - 900 nm, 47% immediately migrated

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**Mechanism of Action at the Cellular Level**
- Chromophores are components of various cells and sub-cellular organelles which absorb light.

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**Physiological Effects**
- Photobiomodulation initiates a biochemical cascade of events that results in:
  1. A reduction in pain
  2. A modulation in the inflammatory response
  3. An increase in microcirculation
- Therefore there is an acceleration in tissue repair and wound healing

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**Current Research Involving Relief of Pain**
- 2009 Chew - Lancet: Neck Pain: "Laser therapy reduces pain immediately in cases of acute neck pain and up to 22 weeks after completion in patients with chronic neck pain."
- 2010 American Physical Therapy Association: Clinical practice guidelines: "Clinicians should consider the use of laser therapy to decrease pain and stiffness in patients with Achilles tendinopathy."

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Photonic energy stimulates the photoreceptor on the mitochondria to decrease the reaction time for cytochrome c to become cytochrome c oxidase. This facilitates an increase in the cellular respiration rate.
Mechanism of Action: Analgesia

- Increased nitric oxide production
- Increased in beta endorphins
- Decreased bradykinin levels
- Ion channel normalization
- Stabilizes the action potential
- Increase serotonin release
- Increased release of acetylcholine
- Blocked depolarization of C-fiber afferent nerves

Biochemical/Physiological Cascade of Events Resulting in Analgesia

- Increased in beta endorphins
- Serotonin release
- Increased nitric oxide production
- Stabilized action potential
- Increased acetylcholine
- Decreased bradykinin levels
- Ion channel normalization
- Blocked depolarization of C-fiber afferent nerves

Integration of Laser Therapy into Your Pain Management Protocols

"DIVINUM EST OPUS SEDARE DOLOR" 

Divine is the work to subdue pain  
—Hippocrates

Relief of Pain Requires a Multimodal Approach

- Routine Surgical Pain Management
- Orthopedic Surgical Pain Management
- Non-Routine Surgical Pain Management
- Dental Pain Management

Perioperative Pain Management

- Surgical Pain Management
- Orthopedic Pain Management
- Non-Surgical Pain Management
- Dental Pain Management

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**Laser Therapy: A Paradigm in Veterinary Practice**

Presented at the 2013 AAPM Annual Meeting
April 11-14, 2013, Fort Lauderdale, FL

A Pilot Study to Determine the Efficacy of Therapeutic Class IV Laser Treatment on Local Muscle Spasm Associated with Myofascial Pain Syndrome in Patients with Neck Pain

Eric Liao, MD (1), Michael Zubal, MD (2), Steven Calvino, MD (1), Rudy Malayil, MD (1), Eric Lee, MD (1), Alfredo Szuba, MD (2)

(1) NYU Langone Medical Center, NY (2) New York University Pain Management Program, NY (3) NYU Medical Center, NY (4) NYU School of Medicine, NY (5) Weill Cornell Medical Center, New Presbyterian Hospital, NY

1. 10 patients with at least one month of myofascial neck pain
2. Results
   - Visual Analogue Scale: baseline 5.2 to 5.0 (SD of 1.6); post treatment (day 15), reduced to 3.1 (SD of 1.6)
   - Visual Perceptual Pain Imagery: 77% of patients improved after treatment; 22% very much improved, 28% moderately improved, 22% no change
   - Muscle Pain Function Scale: 77% of patients with positive trigger points post treatment had no positive trigger points post treatment

3. Conclusions
   - Class IV laser therapy is efficacious for the treatment of pain.


**Rosenbaum, T, PhD, Simon, S, PhD, L, PhD** 2007

**Chow, R.T. and Barnsley, L.** 2005

**Nicolau, R.A., Martinez, M.S., Rigau, J. and Tomás, J.** 2004

**Ohno T. and Tsuchiya K, et al.** 1993

**Ceylan Y, Hizmetli S., Silig Y.** 2004

**Montesinos, M., et al.** 1988

**Eric Lee, MD, MA (1), Michel Dubois, MD (2), Steven Calvino, MD (1), Rudy Malayil, MD (1), Eric Lee, MD (1), Alfredo Szuba, MD (2)**

(1) NYU Langone Medical Center, NY (2) New York University Pain Management Program, NY

**Visual – Analogue Scale:**

- Pretreatment (Day 15), 52.9 (SD of 32.4)
- Post treatment (Day 15), reduced to 30.0 (SD of 19.9)

**Muscle – Pain Detection Device:**

- 71% of patients with positive trigger points pretreatment had no positive trigger points post treatment

- Patient reported Global change very much improved, 33% moderate improvement, 22% no change

**Ronald J. Riegel D.V.M., FASLMS, VMSO**
Perioperative Pain

Canine Ovariohysterectomy; hospitalized for 24 hours.

**Pre-emptive analgesia:**
- Morphine: 0.5 – 1.0 mg/kg SQ 30 minutes before general anesthesia.
- Acepromazine: 0.02 mg/kg SQ.
- Atropine: 0.04 mg/kg SQ.

**Pre-emptive and postsurgical analgesia:**
Administration of photobiomodulation utilizing a non-contact sterile technique.

- Dosage: 2 joules/cm²
  1. Stretched associated ligaments and to any manipulated visceral structures.
  2. Incision before closure of peritoneum.
  3. Incision upon closure of dermis.

Postoperative analgesia:
- Good nursing care. Ice, lubricate eyes, soft recovery area and support during recovery.
- Morphine: 0.5 – 1.0 mg/kg at 3 to 4 hours post-op.

**Analgesia for night:**
- Buprenorphine: 0.01 mg/kg SQ.

**Twenty-four hours:**
- Administration of photobiostimulation in a non-contact technique over the incision site.
- Dose: 2 – 4 joules/cm²
- NSAID: carprofen or meloxicam

**Discharge analgesia:**
- Carprofen 4 mg/kg PO or tramadol 2 – 3 mg/kg PO.

Declaws:
- 1 – 2 joules/cm²
- One day post op:
  Feet are very comfortable

“Jessie” – 4yo Boxer Post op ACL repair (Lateral Suture)
- 6 – 8 joules/cm²
- Immed. Post-op
- Then, Days 1, 3, 5, 7, 9
# Acute Pain Management

- **Acute musculoskeletal pain:**
  - back pain, limp, toenail/nail bed, sprain
- **Acute dermatologic pain:**
  - hot spot, abscess, wound, anal glands, otitis
- **Acute gastrointestinal pain:**
  - parvovirus, pancreatitis, colitis
- **Acute urinary pain:**
  - cystitis, pyelonephritis, urinary obstruction

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## Cervical Disc Pain

<table>
<thead>
<tr>
<th>Dosage:</th>
<th>8 – 10 J/cm²</th>
</tr>
</thead>
</table>

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## Urinary Tract Pain

- **Urothels ~ FUS ~ Interstitial Cystitis**
- **Pyelonephritis ~ Urethral Obstruction**

<table>
<thead>
<tr>
<th>Dosage:</th>
<th>10 J/cm²</th>
</tr>
</thead>
</table>

Positioning the patient very important.

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## Gastrointestinal Pain

- **Pancreatitis ~ Parvovirus ~ GI Surgery**

<table>
<thead>
<tr>
<th>Dosage:</th>
<th>8 – 10 J/cm²; lateral recumb. both sides and ventrally</th>
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## Acute Pain Management

- **Acute musculoskeletal pain:**
  - back pain, limp, toenail/nail bed, sprain
- **Acute dermatologic pain:**
  - hot spot, abscess, wound, anal glands, otitis
- **Acute gastrointestinal pain:**
  - parvovirus, pancreatitis, colitis
- **Acute urinary pain:**
  - cystitis, pyelonephritis, urinary obstruction

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## Burn

- **Cat foot pad**
- **Stove top**

<table>
<thead>
<tr>
<th>Dosage:</th>
<th>1 – 2 J/cm²</th>
</tr>
</thead>
</table>

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## Otitis

- **Bake**
- **Cat foot pad**
- **Stove top**

<table>
<thead>
<tr>
<th>Dosage:</th>
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Positioning the patient very important.
Laser Therapy: A Paradigm in Veterinary Practice

Chronic Pain Management

- Chronic Osteoarthritis
- Chronic Dermatologic Conditions
- Chronic Respiratory Conditions
- Chronic GI conditions

 DX: Bilateral degenerative joint disease of the coxofemoral joints; eight years duration.

Initial pharmacological plan:
- Amantadine: 2–5 mg/kg PO sid. Treatment for central neuronal hyperexcitability (windup).
- Carprofen: 4 mg/kg PO bid. NSAID.
- Gabapentin: a form without xylitol. 5–10 mg/kg bid.
- Adequan®: 2 mg/lb. twice weekly for four weeks.

Therapeutic photobiomodulation:
- Aggressive phase: 100 J/cm² at least three treatments; dosage 8 to 10 J/cm². Include treatments of the lumbar spine and acupuncture points: GB 29 to 30, BL 40 – 54, GB 34 and BL 11.
- Transitional phase: twice/week on both hips and lumbar spine with constant re-evaluation at each therapy session.
- Maintenance phase: therapy as needed (one treatment every 3–5 weeks) to maintain comfort.

Chronic Dermatologic Conditions

Chronic otitis:
10 – 12 J/cm² each day for three days then every three or four days until goal is reached then once per month to maintain.

Nutrition and nutriceuticals:
Evaluate diet
Omega 3's
Chondrotin

Physical therapy
Stretching exercises
Rehabilitation exercises
Swimming

Modifications to environment
Ramps
Rugs on slippery floors
Limit access to stairs

Stomatitis Cat
Laser Therapy: A Paradigm in Veterinary Practice

How does laser therapy reduce inflammation?

Inflammation: *Inflammation*; “I ignite, set alight.”

The fundamental acute inflammatory reaction to any form of trauma is ubiquitous regardless of the inciting cause; surgical, pathogenic or physical trauma.

A study of the effects of LLLT using red and NIR wavelengths on acute inflammation in the rodent model.


LLLT significantly reduced acute inflammation.

Comparative analysis of two low-level laser doses on the expression of inflammatory mediators and on neutrophils and macrophages in acute joint inflammation.

Santos, S.; Alves, A; Lead-Junior, E; Albertino, R; Vieira, R; Ligeiro, A; Silva, J; Carvalho, P. Lasers Med Sci. 2013 Oct. DOI: 10.1007/s10103-013-1467-2

Reductions in IL-1β, IL-6 and TNF-α and inhibition of inflammatory cells.

Biochemical Mechanisms Resulting in a Reduction of Inflammation

Inhibits the synthesis and secretion of inflammatory prostaglandins yet stimulates prostaglandins that have a vasodilatory and anti-inflammatory action

Stabilization of the cellular membrane

Enhancement of ATP production and synthesis

Stimulation of vasodilatation

Acceleration of leukocytic activity

Reduction in interleukin 1

Feline Asthma

Laser therapy will provide:

- Pain relief
- Reduction in inflammation
- Improved quality of life

Target dosage: 6 – 8 J/cm²

Frequency of therapy: three out of first four days then three times per week then once a week till managed.

Feline asthma will respond by 6 – 8 treatments.

Stomatitis Cat

6 treatments over 2 weeks

Picture taken 1 month later

Chronic Respiratory Pain Management

Laser therapy will provide:

- Pain relief
- Reduction in inflammation
- Improved quality of life

Target dosage: 6 – 8 J/cm²

Frequency of therapy: three out of first four days then three times per week then once a week till managed.

Feline asthma will respond by 6 – 8 treatments.

Stomatitis Cat

6 treatments over 2 weeks

Picture taken 1 month later

Laser Acupuncture

Superficial points:

- Feline: 1 – 2 Joules
- Canine: 4 – 6 Joules
- Equine: 150 Joules

Deep points:

- Feline: 2 – 4 Joules
- Canine: 8 – 12 Joules
- Equine: 180 – 200 Joules

Cranial to Caudal

Dorsal to Ventral

Cranial to Caudal

Dorsal to Ventral
Stimulation of vasodilatation
An increase in:
- Nitric oxide
- Serotonin
ROS

Ten minutes post 2400 Joules
Ry minutes
Promenade Sports Medicine, Toledo Ohio 2005

Extensor carpi radius brevis tendon

Two minutes prior to therapy at 10 J/cm²

Ten minutes post therapy

MODULATION OF THE INFLAMMATORY REACTION

Increased leucocyte activity

Increased production of ATP

IL-1 Decrease

Cell membrane changes
Ca²⁺, Na⁺, K⁺ Ion Changes

Reactive oxygen species production

Increased lymphocyte response

PGI₂ Synthesis

Pyotraumatic Dermatitis

Three hours post administration

Administration of 5 J/cm²

Emission of 600 Joules

Day 1 Post-op - Before Treatment

2 yr old M Doberman 80 lbs
TPLO with extensive bruising and edema
24 hrs post-op

Day 4 Post-op – after three treatments

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John C. Godbold, DVM
Stonehaven Park Veterinary Hospital / Laser Surgery Center

Ronald J. Riegel D.V.M., FASLMS, VMSO
Ruptured Pelvic Tendon

1/7/14
Photos and case courtesy of Dr. Ryan Meeks and The Sanctuary, Ocala, FL

1/14/14
36,000 Joules three consecutive days and then every other day for two treatments

Mare was breed back and conceived!

How does photobiomodulation accelerate the healing process?

Twenty Six Day Progress

Laser Therapy Facilitates Superficial Wound Healing in Humans: A Triple-Blind, Sham-Controlled Study
Hopkins et al J Athl Trainer 2013

• Triple-blind, sham-controlled in-vivo human study
• Identical skin wounds were created in 22 volunteers age = 21 +/- 1 years
• Randomly placed in a control, sham laser or laser treatment group
• 8 J/cm², 820 nm laser
• Measured epithelial migration

153% greater wound contraction at day 6 in the laser group

High Powered Laser Therapy Enhances Muscle Healing
Matthew C. Kostek, Diana C. Delgado-Diaz, Bradley Gordon

• Subjects underwent muscle damage protocol using isokinetic dynamometer
• 48 hours after damage, laser administered to one leg
• 6 hours after laser treatment, muscle biopsies were collected
• C2C12 cells were grown in standard culture conditions and received daily laser treatment

RESULTS: Laser treatment increased markers of muscle repair and enhanced muscle cell proliferation in culture.

CONCLUSIONS: High powered laser treatment is effective in increasing molecular markers of muscle repair after damage.
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**Accelerated Tissue Repair**

Photobiomodulation increases the production of ATP

This increases the energy level of the cell to expedite the uptake of nutrients and speed the elimination of waste by products

Increases the rate of cellular mitosis and collagen synthesis

Karu T et al. 2001


**Biochemical/Physiological Cascade of Events Resulting in Accelerated Tissue Healing**

- Increased vascular regeneration
- Increased leukocyte activity
- Increased macrophage activity
- Increased fibroblast proliferation
- Increased tensile strength
- Enhanced cell differentiation
- Reduced Healing Time

**Tendon Injury**

On March 10th, an 8-year-old Warmblood show jumper was presented with an acute right forelimb lameness after a competition over a poor surface.

**There is an increase in the leukocytic and macrophage infiltration.**

Karu, P. Young, L. and Dyuse M. 1981

Activates fibroblasts and other tissue repair cell types.

These regenerative cells allow tendons, ligaments, bones and muscles to heal at an accelerated rate

Alexandratou, E., Yova, D., Handris, P., Kletsas, D. and Loukas, S. 2002


Bjordal et al. 2007)

**Effect of Near-Infrared Light Exposure on Mitochondrial Signaling in C2C12 Muscle Cells**

Linda M. D.-D. Nguyen, Angelina G. Malamo, Kelly A. Larin-Kaiser, Paul A. Borsa, Peter J. Adhihetty

- Treated C2C12 murine skeletal muscle cells with different laser doses: 810/980 nm: 8.14 J/cm², 14.85 J/cm², 22.8 J/cm², 29.6 J/cm²
- Measured activation of mitochondrial biogenesis signaling molecules (AMPK, p38)
- Applied optimal treatment dose over 4 consecutive days
- Significant increase in mitochondrial biogenesis markers
- Conclusion: Laser light is capable of altering mitochondrial signaling and regulatory proteins in skeletal muscle tissue without cardiovascular and/or inflammatory influence.
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Day 7: Large area skin slough

Day 7

Epithelial Migration Rate in Wounds:

- Expected / normal: 0.5 – 1.0 mm/day
- With Class 4 laser therapy: 1.6 mm/day

Day 7

Standard wound therapy with lavage, antibiotics and pain medications.

Began Class 4 laser therapy
Target dose 3 – 5 Joules/cm²

Day seven

Wound healing

Hx:

- 7 Yr. old QH
- Approximately four inches of muscle lost.
- Unable to walk forward with that leg
Effect of low-level laser therapy on the fracture healing process.

Kazem Shakouri S, Soleimanpour J, Salekzamani Y, Oskue MR.

Laser enhances callus development in the early stage of the healing process, therefore, laser therapy may be recommended as an additional treatment in non-union fractures in humans.

Low-level laser therapy enhances the expression of osteogenic factors during bone repair in rats

Tim CRJ, Pinto KN, Rossi BH, Fernandez X, Matsusoto MA, Parizotto NA, Rennd AC.

Laser therapy improved bone healing by accelerating the development of newly formed bone and activating the osteogenic factors on tibial defects.

The low level laser therapy effect on the remodeling of bone extracellular matrix

de Sousa Merli LA1, de Macedo V, Toma L, Reginato RD, Katchburian E, Nader HB, Faloppa F.

The expression of osteonectin and osteocalcin supports their role in bone mineralization protein, therefore, LLLT accelerates this process. The overall data show that LLLT bone changes dynamic array, shortening the time period involved in the bone repair.

Bone healing effects of diode laser (808 nm) on a rat tibial fracture model

Son JH, Kim YB, Ge Z, Choi SH, Kim G.

These findings suggest positive effects of LLIT in accelerating the bone healing process, especially in the early stage of bone formation.

Low-power laser therapy for repairing acute and chronic-phase bone lesions

Joshi FC, Bele MA, Beletti ME, Okubo R, Prado EJ, Casale RV.
Res Vet Sci. 2013 Feb;94(1):105-10

Laser therapy aided the bone consolidation process and favored the physiopathologic mechanisms involved in bone tissue repair, and its effects were more prominent when treatment started during the acute phase of the injury.

Effect of 940 nm low-level laser therapy on osteogenesis in vitro.

Joshi MK, Hussein A2, Aslina A3, Alam MK4, Hassan R4, Shauri RS.
J Biomed Opt. 2013 Dec 1;18(12)

LLLT plays an important role in stimulating osteoblast cells for improved bone formation.

Photobiomodulation of a Delayed Union Fracture

Emilera Zhufi, DVM
Valle Park Animal Hospital
Vallejo, California

Low-Level Laser Therapy (LLLT) is a non-invasive treatment that uses a low power laser to stimulate tissue regeneration and healing.

Treatment plan:
- Laser therapy daily for two weeks
- Nolvasan ointment after Betadine scrub
- Systemic antibiotics
- Laser therapy EOD for 4 weeks

PROGRESS:
- Able to walk comfortably after first seven laser therapy sessions.
- Sound at walk in 8 weeks.
- Note lack of granulation tissue.

Delayed or Non-union
- Slow healing
- Poor apposition
- Routine as part of post surgical protocol

Fractures

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Four weeks fracture site still mobile
Made a window in the Meta splint and therapy applied at all angles
Twice/week for five weeks
Dosage: 8 J/cm²

After five weeks and ten therapy sessions
Creation of angiogenesis and a reduction in edema resulting in a better healing environment

Diagnosis:
• Fracture in the proximal aspect of the left radius.
• “The fracture is segmental, with mild cranial and proximal displacement of the distal segment and mild cranial displacement of the short middle segment”
• Moderate soft tissue swelling surrounding the fracture site.

Great Horned Owl

Unknown sex, unknown age

Ashley Schuller, RVT
University of Georgia Zoological Medicine Technician

Ashley Schuller, RVT
University of Georgia Zoological Medicine Technician

Radiographs

Laser Therapy

• Dates of Therapy
  – 1/4/13
  – 1/7/13
  – 1/10/13
  – 1/14/13

Discharged 1/23/2013

Total Joules: 444.5 J
Bob Marley gets hit by a car!

Bob Marley is a yellow Labrador that was brought in the day after being hit by a car.

He suffered some minor road rash but also suffered degloving injuries to the pads on his feet.

Pads were treated with 150 Joules to each injury while cycling through frequencies from CW to 500 Hz then 10,000 Hz. No other treatment was performed.

24 hours later the wounds were dry and showed no erythema.
He showed no sign of lameness and it appeared the wounds were already undergoing cornification.

“Hank”

Unknown degloving injury to metatarsal pad
Very inflamed and uncomfortable
Patient was licking it incessantly
Treated once with laser and returned two days later

Wound edges had adhered and contracted.
Inflammation had decreased significantly
Hank was far more comfortable and was 90% weight bearing
Licking had decreased
Treated once more and did not require further treatment
Questions

Part Three: Basic Application Techniques

Goal: consistent clinical results.

Correct dosage
Administration techniques
Frequency of administration

Non Contact Administration

Contact Administration

Reflected (65-70%)
Scattering (5%)
Incidental absorption
Melanin, hemoglobin, water
Target cell
Transmission

Reflected (20-25%)
Scattering (5%)
Incidental absorption
Melanin, hemoglobin, water
Target cell
Transmission

Non Contact Application (Less due to blanching)
Administration Techniques

- Keep the probe perpendicular to the dermis whenever possible.
- Utilize a slow “erasure” type movement when administering therapy.
  - 4 – 6 cm/second.
  - **Treat Long and Slow!**
- Drag a finger to monitor temperature
- Place the anatomical area through a passive range of motion during administration

Know how to use your handpiece.

- Know how to use your handpiece.
- Apply therapy perpendicularly to the target
- Power density equal throughout
- Power density varies throughout

Scanning application technique vs point to point
Laser Physics

Power = Energy/time
1 Watt = 1 Joule/second
A Joule is the international system unit of energy
Therefore:
Therapeutic energy = Power (Watts) = Joules/second x time (seconds)

Therapeutic Application

Dosage = Energy/Area
Dosage = Joules/cm²
Laser therapy is based on the number of Joules administered to a specific anatomical area with specific dimensions

Dosage considerations:
Body type (mass)
Skin color
Anatomical area to be treated

Established Therapeutic Dosages

Dosage is a function of the target tissue. There are no global dosages.

Superficial penetration:
Surgical incisions: 2 – 6 Joules/cm²
Deep tissue penetration: 8 - 10 Joules/cm²
Intraarticular Unique applications: 10 - 30 Joules/cm²
Lumbar spine, hips and lick granulomas

Dosage Calculation Shortcut

Dosage calculation
Literature states: 5 - 10 J/cm²

The back of a playing card is 2.5" x 3.5" = 8.75"
8.75" x 8.75" = 6.45 Sq. cm
60 J/cm² = 600 Joules
10 J/cm² = 1000 Joules

Index card area:
100 Sq. cm
10 J/cm²
1000 Joules

Therapeutic Dosage Calculation Shortcut
Laser Therapy: A Paradigm in Veterinary Practice
Can one overdose?

Frequency of Administration

- Set realistic goals with the client
- Unique to each patient and client
- Re-evaluations performed before each therapy session
- Aggressive: Each day for three treatments, then EOD for three treatments, then twice/wk. till resolved or the treatment goal is met
- Chronic conditions: Three treatments the first week, then twice per week till the goal is met, then maintenance as needed for quality of life
- Aggressive, Transitional, Maintenance

Dependent on client compliance

Ronald J. Riegel D.V.M., FASLMS, VMSO
Laser Therapy: A Paradigm in Veterinary Practice

Cumulative Therapeutic Effect of Laser Therapy

Physiological response

- Initial treatment
- Second treatment
- Third treatment

Questions?

Part Four: Expected Clinical Outcomes

Diagnose before initiation of laser therapy.

Physiological Exam Utilizing Digital Infrared Imaging

New Technology

Analytical Techniques:
- Digital Infrared Thermography
- Digital Radiography
- Magnetic Resonance Imaging
- CT Scanning
- Ultrasonography
- Diagnosis
**Laser Therapy: A Paradigm in Veterinary Practice**

**Anatomical vs. Physiological Imaging**

- **Anatomical Imaging**
  - Radiographs
  - Magnetic Resonance Imaging
  - Ultrasonography
  - CT Scans

- **Physiological Imaging**
  - Digital Infrared Thermography
  - Scintigraphy

**What is Digital Infrared Thermography**

It is measurement of radiated energy from the target tissues.

It is measure of the physiological processes within the tissues. i.e. increased circulation and pain

FDA approved as an adjunctive or supportive evaluation of the patient.

**The Four Basic Principles of Digital Infrared Thermal Imaging**

1. **Objective**: The camera detects energy from the subject therefore there is no prejudice or influence of the results.
2. **Non-invasive**: Infrared cameras only measure energy entering the camera lens. They emit nothing.
3. **Quantitative**: There is a representation of the color differences.
4. **Qualitative**: There are pattern formations (thermal gradients) associated with various areas of the body.

**Diagnostic Thermography**

Turner, TA

*Vet Clin North Am Equine Pract* 2001; Apr;17(1): 95-113

- Thermography is a tool in the evaluation of lameness
- Increases the accuracy of diagnosis
- Useful in early identification of stress injuries.
- Complementary to other imaging techniques such as radiology, ultrasonography and scintigraphy.

**Thermographic Diagnostics in Equine Back Pain**

Graf von Schweinitz D


- Infrared thermographic imaging is the most sensitive objective imaging currently available for the detection of back disorders in horses.
- A physiological study of pain.
- Chronic back pain usually involves vasoconstriction and (IT) gives us the opportunity to appreciate chronic pain phenomena that involves non-inflammatory events.

**Thermography in the Diagnosis of Inflammatory Processes in the Horse**

Paredes, RC, McCay MD


- Three phase study:
  - Before and after exercise
  - Acute and chronic inflammatory processes
  - Evaluation of anti-inflammatory drugs
  - Successful detection of: subluxation of the third lumbar vertebrae, a substellar abscess, alveolar periostitis and abscess, laminitis, arthritis of the femoropatellar joint and tendinitis.
  - Effective in quantitative and qualitative evaluation of anti-inflammatory compounds on chemically induced inflammation.

**Monitoring changes in skin temperature associated with exercise in horses on a water treadmill by use of infrared thermography.**

Varnell K, Fleming L, Stratton TD, Brassington R


IRT is able to non-invasively detect muscle activity and associated changes in blood flow whilst horses are exercised on a water treadmill. IRT could potentially be used as an alternative method to assess muscle activity and temperature change in an aquatic environment where existing methods present methodological challenges.
Effects of infrared camera angle and distance on measurement and reproducibility of thermographically determined temperatures of the distolateral aspects of the forelimbs in horses.
Westermann S, Buchner HW, Schramel JP, Tisky A, Starck C.

CONCLUSIONS AND CLINICAL RELEVANCE:
Thermographically determined temperatures were unaffected by 20° changes in camera angle or a 0.5-m increase in camera distance from the forelimb. Minor temperature differences between left and right forelimbs were detected in the study and should be considered during diagnostic investigations.

Medical infrared imaging (thermography) of type I thoracolumbar disk disease in chondrodystrophic dogs.
Grossbard BP, Loughin CA, Marino LJ, Marino DJ, Sackman J, Umbaugh SE, Afruz L, Saaloo P, Lesser ML, Akerman M.
Department of Surgery, Long Island Veterinary Specialists, Plainview, New York.

OBJECTIVE:
To: (1) determine the success of medical infrared imaging (MII) in identifying dogs with TUDD, (2) compare MII localization with magnetic resonance imaging (MRI) results and surgical findings, and (3) determine if the MII pattern returns to that of normal dogs 10 weeks after decompression surgery.

CONCLUSIONS:
MII was 90% successful differentiating between normal dogs and 97% successful in identifying the abnormal intervertebral disc space in dogs with TUDD.

How does infrared thermography work?
• The thermographic camera detects radiant energy being emitted from the body and converts them to an image we can see.
• Changes in blood flow directly correlate with inflammation, a strain or a sprain.
  – Where there is increased circulation there will be an increase in the thermal gradient (warmer).
  – The opposite is also true: With chronic disease, scarring, atrophy (muscle wasting/loss), nerve damage, or disuse, areas depict cooler.

Why use digital thermographic imaging as an addendum to laser therapy?
• Visualization of pain
• Client education
  • Identification of additional secondary areas requiring laser therapy.
  • This provides a better treatment outcome
  • Increases the revenue generation.
• Monitoring the application of laser therapy
• Evaluation of the patient on subsequent visits
• Discovery and prevention of injuries.
• Routine performance exam to identify musculoskeletal stress and strain visually.

Visualization of Pain and Increased Circulation

Symmetry is the key to interpretation
• By comparing the patient’s anatomical areas left-to-right, the individual patient serves as its own control.

Nerve irritation on left
Compensatory muscle use on the right
IVDD
Monitor Laser Therapy Progress

Initial Thermograph

Four Hours Post Therapy

He: ~30 days post spay. Clinical signs: Tender around incision.

Initial Thermograph

Thermograph during laser administration

Three hours post laser treatment

Common Conditions in Daily Practice

Canine:
1. Vaccinations
2. Dental disorders
3. Ear disorders
4. Derm./allergies
5. Acute ortho.
6. Chronic ortho.
7. Organic disorders
   Urinary and G.I.

Feline:
1. Vaccinations
2. Dental disorders
3. Urinary disorders
4. Chronic ortho.
5. Derm./allergies
6. Organic disorders
   G.I.
7. Acute ortho.

Multi-center Efficacy Summary

International summary of information from the records of three veterinary hospitals

Stoney Creek Veterinary Hospital
Morton PA
Pierrefonds Animal Hospital
St. Genevieve, Quebec
Dyrlægehuset
Odense, Denmark

Data collected over four months:
165 Cases: 120 Canine; 45 Feline
Patient assessments were scored on a four-point scale: excellent, good, average or poor by the clinician and correlated to appropriate quantitative measures for the condition when possible

Equine:
Musculoskeletal disorders
Trauma
Performance maintenance
Upper respiratory disorders
Acupuncture point stimulation
Laser Therapy: A Paradigm in Veterinary Practice

**CLINICAL ASSESSMENTS**

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96% of the canine cases exhibited a good to excellent response to therapy.
93.3% of the feline cases exhibited a good to excellent response to therapy.

---

### Osteoarthritis

Photobiomodulation is effective in the treatment of chronic joint disorders if the dose is adjusted to treat joint capsule inflammation. (meta analysis, systematic review)
Lopes-Martins et al. 2008; Bjordal 2011)  

**11 trials, 730 patients**

In rats with experimentally induced knee inflammation, photobiomodulation (810 nm) effectively.
Pallotta et al. 2012

Reduced inflammation in synovial fluid and tissue, decreased PGE2, myeloperoxidase

---

Laser Therapy Reduces Time To Ambulation In Dogs After Hemilaminectomy  
Draper WE, Schubert TA, Clemmons RM, Miles SA.  
Department of Small Animal Clinical Sciences  
College of Veterinary Medicine University of Florida  

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Effects of Laser Treatment on the Expression of Cytosolic Proteins in the Synovium of Patients With Osteoarthritis.  
Six patients. Six synovial membrane samples. Untreated from each patient acted as control. 807-811nm 25 J/cm²  
Increased expression of proteins within synovium

**Osteoarthritis**

**Benefits of laser therapy:**
- Pain management
- Reduction of interleukin 1
- Photobiomodulation results in a re-growth and replication of the chondroblasts
- Increased NO levels especially in older patients

Apply the therapy where they hurt plus all secondary areas that would be compensatory.

Digital Infrared Thermography will aid in the identification of secondary compensatory areas.

**Chronic Arthritis in a Geriatric Feline**

**History:**
- 16 yr old MN DSH 6.5 lbs
- Chronic renal disease/failure
- Loss of muscle mass and coordination
- Chronic arthritis throughout

**How do you help this patient’s condition and quality of life?**

John Godbold Jr., DVM

**Aggressive phase:**
- Every other day treatments until a response is noted.
- Target Dose: 6 Joules/cm²
- Treatment Area: 500 cm²
- Total Dose needed: 3000 Joules
Degenerative joint disease

PENGUINS

History: 18 Yr. old. Limping started 11/08. Initial treatment with NSAD Metacam 02/09.

Dx: DId of both stifles. Confirmed on radiographs and CT scan at U. of PA on 08/09.

Pharm. Tx: Combinations of Metacam, Omega – 3 and Tramadol

Only improved when all three combined

Laser Tx: Mar. 27th, 18th, 19th, 23rd, 24th, 26th,

30th, Apr. 1st, 6th, AND 8th.

Results: Stayed sound till 4/22 touch up on 28th,

then lasted three to four weeks with a reduction of medications.
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Collapsed IV Disk Space

Patient history:
- 16 yr old MN Poodle
- Marked lumbar pain
- No neurological deficits
- Collapsed L4 - L5 IV disk space
- Sclerotic changes in L4 & L5

Multi-modal anti-inflammatory and pain medications were initiated.
Medications were stopped after vomiting and anorexia were noted.
Laser therapy initiated as an alternative to medications.

Aggressive phase:
Six treatments every other day
Total energy delivered – 900 Joules
Target area – 100 cm²
Target Dose – 9 J/cm²

Maintenance phase:
Therapy every 3-4 weeks.

Hemivertebrae: Neurological Deficits

History:
“Macy” 7 yr old FeS Boston Terrier
Progressive neural deficits since 3 years of age

DX:
Multiple hemivertebrae
Non-responsive to NSAIDs and cortisone
Proprioceptive deficits, spinal reflexes and reactions reduced.
Urinary and fecal incontinence.
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Treatment Plan:
EOD Therapy
Spine: 10 Watts CW 1 Min = 1800 Joules
Dorsal-caudal abdomen:
10 Watts CW 2 min = 1200 Joules

Therapy protocol:
Six treatments administered every other day for two weeks.
Target area – 300 cm²
Target Dose – 10 Joules/cm²
Total Energy Delivered – 3000 Joules

Progress:
No response after initial six treatments.
Recommended six additional treatments:
EOD for two weeks
After nine treatments (four weeks) the owner reported:
“Moving up and down steps for the first time in years.”
No involuntary eliminations in crate at night.

Acute Conditions

Goal:
Laser therapy is applied until the condition is resolved.

Frequency of therapy:
Aggressive: daily for three sessions/three sessions in four days.
Then: every other day or every second day until the condition is resolved or the treatment goal is accomplished.

Acute Dermatological Applications

Pyotraumatic dermatitis
Pododermatitis
Generalized pruritis

Superficial Pyoderma

Many superficial pyoderma cases can be treated without the use of systemic medications
Scan the entire area affected, including surrounding healthy tissue margins.
Frequency of treatments may be dictated by the severity and the response of the patient.

Jaxson, a 3 yo terrier mix
Dx: superficial pyoderma of the abdomen.
Moderate pruritus present with pustules and crusts covering most of ventral abdomen.
Administered ~500 Joules
Returned on day 3 with almost no pruritus, virtually all pustules and crusts were gone, and only mild erythema present.
**Pododermatitis**

Six therapy sessions
400 Joules each over 16 days

**Anal Sacculitis**

Trouble, a terrier mix, presented with a ruptured anal sac.
The area was cleaned and the sac was expressed of all material.
Administered ~300 joules at 5 W
Frequency was modulated through Cw to 500 Hz then 10,000 Hz.
He returned the following day for follow up.

**Guinea Pig Pododermatitis**

Prior to laser therapy
One week after three laser therapy sessions

---

**Pilot study on the use of diode laser therapy for treatment of dermatitis in koi carp (Cyprinus carpio).**

Pees M, Schmidt V, Pees K.
Tierarztl Prax Ausg K Kleintiere Heimtiere. 2011

A diode laser with a wavelength of 980 nm and an energy density of 9 J/cm²
Laser technique can be recommended for the treatment of dermatitis in koi, especially in cases of unsuccessful treatment using anti-infective drugs, and for the treatment of Dermocystidium infections.
**Pyotraumatic Dermatitis**

Daisy, a labrador retriever

hot spot at base of tail.

Area was clipped and treated with 300 joules

She returned for a treatment on days 3 and 4.

No topical therapy was used.

Erythema was nearly gone by day 4

no other treatment was required.

---

**Furunculosis**

Common problem with often difficult treatment outcomes.

Only treated with laser therapy

Goal: address pain, swelling, wound healing, and surface infection.

---

**Feline Abscess**

Goal: Reduce pain and swelling and reduce bacterial infection.

Mature DSH cat was presented with an open abscess on a rear paw.

Administered 60 joules.

24 hours: The swelling was virtually gone and the wound no longer appeared open and edges had contracted.

---

Boomer, a 9 year old Labrador

Incessant licking at wound for 1 week.

Wound was treated twice over 3 days.

Dosage: ~ 300 Joules

Within 48 hrs the licking had almost stopped and the ulcerated surface had shrunk approximately 40%

with marked epithelialization

No further treatments were necessary.

Total cessation of licking
Mature lab mix was presented for a traumatic wound of unknown cause on a rear paw. She was licking the wound incessantly and moderate swelling was occurring in the surrounding tissue.

Dose of 3 Joules/cm² on days 1, 3, and 5

By day 3, swelling had decreased an estimated 30% and licking had slowed considerably.

Evaluated again on day 7.

No other therapies were given. By day 3, swelling had decreased an estimated 30% and licking had slowed considerably.

Evaluated again on day 7.

No other therapies were given.

By day 3, swelling had decreased an estimated 30% and licking had slowed considerably.

Evaluated again on day 7.

No other therapies were given.

By day 3, swelling had decreased an estimated 30% and licking had slowed considerably.

Evaluated again on day 7.

No other therapies were given.

By day 3, swelling had decreased an estimated 30% and licking had slowed considerably.

Evaluated again on day 7.

No other therapies were given.
Thermal Burns in a Ball Python

Patient: “Voodoo”, Ball Python, mature male

Procedure:
Laser therapy was used twice in conjunction with topical wound therapy and injectable antibiotics.

Dosage: 3 Joules/cm²

Results:
Lesions on the ventral scutes showed significant response after the first treatment and further healing after the second (Fig. 3). There were minimal permanent changes in the skin.

Chronic Conditions

Goal:
Laser therapy is applied until the condition is manageable or the therapeutic goal is reached.

Administration protocol:
Aggressive phase: Each day or every other day for at least 3 therapy sessions.
Transitional phase: A gradual reduction in the frequency of treatments.
Maintenance phase: Therapy as needed to maintain quality of life.

Otitis Externa

Laser therapy allows not only treatment of the external structures but also treatment of the internal structures externally.

Otitis Externa/Internia

Mild cases of otitis externa respond readily to therapeutic laser.
Topical medications may still be needed but not necessary in all cases.
Pull the pinna outward to straighten the ear canal and keep hand piece moving at all times.
Mild cases respond in a single treatment.
More involved cases will need multiple treatments.

10 year old Labrador with bilateral otitis and an aural hematoma on the right pinna

1 week later
Treatment was delivered with therapy laser on day 1 and day 3. The ear canals and hematoma were treated and he was seen again at day 7. The otitis was virtually clear and the hematoma had begun to regress.
Chronic Dermatological Applications

Lick granulomas
Neuropathic self trauma

Lick Granuloma

5 J/cm² six treatments over three weeks
15 J/cm² four treatments
Over two weeks

30 J/cm² Six treatments over 18 days
Laser Therapy: A Paradigm in Veterinary Practice

**Recurrent Anal Sacculitis**
- Acute rupture with severe pain
- Lavaged and treated with frequency modulated setting

Following day, non painful
Swelling reduced by 50%
No discharge present

**Additional Applications**

**Oral Ulcers**
- Initial
- Day three post two treatments

**FLUTD**

**Versatility in Practice**
• Arthritis
  – Main affected joints: L & R knees
  – Intermittent stiffness
  – Audible crepitus

• Treatment
  – Cosequin supplement

• Treatment area: Stifles
  – Using large non-contact head
  – Protocol:
    – Arthritis pre-set protocol
    – 8-10 J/cm²
    – Lower wattage
  – Plan:
    • SID x 2-3d
    • 2 x week
    • Weekly to biweekly

Part Five: Incorporation into the Sports, Rehabilitation and Regenerative Medicine Practice

Athletic Maintenance and Performance Enhancement

In 33 male athletes performing strength training leg press exercises with load x 12 weeks, the group which had laser therapy of the quadriceps immediately following training had 55% increase in muscle performance (based on isokinetic dynamometry).

808 nm; three groups: control, training, training with laser.

Ferraresi et al. 2011
In 45 female athletes performing isometric knee extensor exercises (cycling) with load to exhaustion, those treated post exercise with photobiomodulation [femoral quadriceps application] showed significantly decreased muscle fatigue (808 nm) **23% decrease in the fatigue index of both limbs**.

“This is relevant to everyone involved in sports medicine and rehabilitation.”

da Brino et al, 2011

---

**Protocols for Maintaining Performance**

**Canine athletes:**
- **Ideal:** After hard work, day before and detail the day of the event.
- **Minimum:** Day before and day of event or at the event.

**Athletes at the race tracks:**
- **Ideal:** After hard work, day before and detail the day of the race.
- **Minimum:** Day before and day of race

---

**Protocols for maintaining performance**

**Hunters/Jumpers, Eventers:**
- Minimum protocol (15 – 20 J/cm²): Lumbar spine and lumbosacral musculature, semimembranosus/semitendinosus
- Stifles, hocks and ankles as needed.
- **FREQUENCY:** Twice/week and each day at the event. Minimum: Day before event.

**Protocols for Maintaining Performance**

**Western horses:**
- **Western Pleasure:** Large dosages will quiet and maintain soundness
- **Dressage:** Lumbosacral, TMJ, base of skull, cervical musculature
- **Cutting and Reining:** Maintenance of soundness

**Incorporating Laser Therapy Into a Physical Rehabilitation Program**

**Benefits:**
- Modulate pain in order to perform physical rehabilitation.
- Decrease inflammation, promote healing
- Studies supporting improved physical performance and decreased muscle injury with laser therapy
- Laser therapy relaxes the patient before physical therapy sessions
Laser Therapy: A Paradigm in Veterinary Practice

**Exxon**
- 3 year old intact male Malinois
- Started to refuse jump and releasing on bite work
- Competes in Mexico, France and the US
- Radiographs normal
- Bunny hopping gait duration of 4 weeks

**Exxon**
- Right iliopsoas injury
- Pain upon palpation
- Decreased hip extension with internal rotation
- Pain at L3 to L7 right
- Roached or increased thoracic extension
- Began treatment of laser to right iliopsoas, lumbar and thoracic region – 10 to 12 joules/cm²
- Total treatment joules – 2100 3 times a week for 3 weeks

**Continued Treatment**
- After 3 weeks, decreased to twice a week
- Additional therapies besides laser included joint mobilization, stretching, and core work
- By 3 weeks, returned to bite work and lower jumps

**Full Return**
- 6 weeks
- Complete training and bite work
- No problems at all
- Continues with underwater treadmill for conditioning once a week

**Regenerative Medicine: Therapeutic Laser + Stem cell/PRP**

**Protocol:**
- Harvest and prepare cells
- Application of laser therapy to anatomical area prior to collection
- Inject ADSC intra-articularly and systemically
- Laser therapy post therapy as indicated

Debbie Gross, DPT, MSPT, Diplomat ABPTS, CCRP

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Part Six: Laser Safety and Contraindications

Laser safety

The number one safety concern with any Class 3b or 4 laser use is protection of the eyes.

Class 4 lasers emit both visible and invisible beams of radiation.

Safety controls supplied by manufacturer

- Appropriate protective eyewear
- Guarded switch
- Hand pieces and accessories
- Labeling/signage according to ANSI Z136.3 2014
- Service and repair

Eye protection is a MUST!

Laser-safe eye protection with appropriate wavelength and optical density should be worn by all in the treatment area.

Be aware that different eyewear is available for different wavelengths.

Protect the eyes of the patients and all others within the NHZ.

The Power of Doggles™
Laser Therapy: A Paradigm in Veterinary Practice

Provide a secure environment:
Post “Laser Warning and Laser in Use” signs on all entrances to the NHZ.
Laser signs must state the Laser classification, wavelength and that eye protection is required.

This is an OSHA requirement for all Class 3 and Class 4 equipment.

Be Proactive
Every hospital or clinic that uses medical lasers should appoint a veterinary medical laser safety officer.
This position should be fulfilled by either a veterinarian, veterinary technician or in an academic institution, possibly by an individual from the safety department.

Veterinary Medical Laser Safety Officer Training
Online
RACE approved
2 credit hours
Attendees will be provided training, protocols, and guidelines to meet the standards set forth by the ANSI 136.3 and OSHA standards and regulations.

Contraindications
Number one concern is the exposure of the retina
Laser therapy should not be administered in the following situations:
- Hemorrhaging
- Any cancerous tissue
On the side of prudence:
- Testicles
- Epiphysitis
- Pregnancy
- Injection sites
- Photosensitive medications
- Cardiac conditions

Part Seven: Return on Investment
What Do I Charge?

Multiple therapy sessions should be customized for each case.
Acute conditions: Initial + additional.
Chronic conditions: Normally at least six sessions.

Benefits:

- Client compliance
- Improved clinical results
- Ease of scheduling

Treat to effect!

What do I charge?

Typical fee schedule:

- **Post-op pain management**: $5 - $18
- **One treatment (acute case)**: $30 - $50

Multiple treatments multiple sites:

- 1 SITE: $40 - $60
- 2 SITES: $50 - $70
- 3 SITES: $70 - $80
- 4 SITES: $80 - $85
- 5 SITES: $90 - $95

Prepaid laser therapy series of 3 – Save 5%
Prepaid laser therapy series of 6 – Save 10%
Prepaid laser therapy series of 9 – Save 15%

Fee schedule example

Chronic hip dysplasia:

- **Aggressive phase**: Three sessions one every other day
- **Transitional phase**: Twice/week for two weeks
- **Maintenance phase**: Once/week for four weeks

Nine total treatments/three sites:

- $60.00 each = $540.00
- Prepay discount = $459.00

Prepayment places compliance on client

Return of investment

1. **Geriatrics**
   - 800.00/Tx
   - 8 Tx
   - $6,400.00
2. **Dermatological**
   - 300.00/Tx
   - 6 Tx
   - $1,800.00
3. **Trauma**
   - 300.00/Tx
   - 8 Tx
   - $2,400.00
4. **Otitis**
   - 300.00/Tx
   - 6 Tx
   - $1,800.00
5. **Post op pain management**
   - 150.00/Tx
   - 5 Tx
   - $750.00
6. **OA**
   - 300.00/Tx
   - 8 Rx
   - $2,400.00
7. **IVDD**
   - 450.00/Tx
   - 8 Rx
   - $3,600.00
8. **Dental conditions**
   - 300.00/Tx
   - 8 Rx
   - $2,400.00
9. **Maintenance plan of 12 visits**
   - pay for 10 get 2 free
   - $3,300.00
10. **Maintenance plan of 5 visits**
    - pay for 5 get 1 free
    - $1,175.00

New revenue source for clinic/month

- $5,555

More Than 50% of Pet Insurance Companies Currently Cover Laser Therapy!

More than 50% of Pet Insurance Companies Currently Cover Laser Therapy!

Conservative Beginning ROI (1 Doctor Practice) Example

3 routine surgeries/wk @ $13 LT each = $78.00
5 acute cases/wk (hot spots, wounds, otitis, etc)
   @ $30 each = $150.00
1 NEW chronic case/wk (3 treatments first week)
   @ $45.00 each = $135.00
2 follow-up chronic cases/wk @ $45.00 each = $90.00

Weekly Revenue: $453.00
Monthly Revenue: $1,812.00
Yearly Revenue: $21,744.00

254x155 to 418x218

Laser Therapy: A Paradigm in Veterinary Practice

Ronald J. Riegel D.V.M., FASLMS, VMSO
Laser Therapy: A Paradigm in Veterinary Practice

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**Average ROI (1 Doctor Practice) Example**

- 8 routine surgeries/wk @ $13 each = $104.00
- 8 acute cases/wk (hot spots, wounds, otitis, etc) @ $30 each = $240.00
- 2 NEW chronic case/wk (3 treatments first week) @ $45.00 each = $90.00
- 4 follow-up chronic cases/wk @ $45.00 each = $180.00

Weekly Revenue = $794.00
Monthly Revenue = $3,176.00
Yearly Revenue = $41,288.00

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**Generated Revenue Survey**

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**Top Reasons Veterinarians Don’t Want to Adopt Laser Therapy**

- We love our drugs!
- Our drugs (drug companies) love us. It is too good to be true!
- Wide margin of error
- Too effective for too many disorders.
- No known side effects
- Inertia. (I learned all I need in Veterinary School and LT was never mentioned.)

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**Questions?**

- We are protocol driven.
- We want to just push a button.
- We are in our safe zone.
- I have good results now.
- The evidenced based medicine mantra.
- I don’t have enough staff.
- My clients won’t pay for it.
Why add laser therapy to the veterinary practice

Three major reasons for adding laser therapy to the practice:
1. Provide a higher quality of care to existing patients.
   Healing modality.
   New approach to many common clinical disorders.
2. Attract new patients.
3. Create a new revenue center that has a technician based income.

Important points in purchasing a therapy laser

Power:
The more watts, the more versatile and the more efficient the treatment times.
Class II and Class III R
7.5 and two 5 mW line generated diodes

Class IIIb

You can apply laser therapy through clothes

Power output is 1.1 W
Laser is in the hand piece
808 nm up to 5 W
Up to 15 W
Emits 4 wavelengths
All protocols are frequency based
.5 to 15 W
Can emit CW for hours.
Wavelength:
The higher the wavelengths within the therapeutic window, the greater the depth of penetration.

Warranty:
How long is the warranty and what exactly is covered? How soon will items be replaced.

Engineering:
Will the laser emit continuously for long periods of time? How long is the battery life and recharge time.

Training:
Who does the training? What is the availability of retraining when the staff changes? Certification? Are webinars available to keep updated on new techniques?

Customer support:
Veterinarian?

Integration into the practice and marketing materials:
Client educational materials/brochures/videos

User references:
Will the company you are considering give you an entire list of customers in your state to contact and not just a select few?

Relationship with the sales representative:
Are they easy to reach and do they provide support after the sale?
The twelve step program for practice integration

Step one: BUILD A FOUNDATION
As the veterinarian, know the versatility and capabilities of this modality
1. Understand how the laser works
2. Seek advanced training:
   Symposia/seminars/webinars
   Collaboration with colleagues

Step Two: TRAIN THE STAFF
Select a laser specialist
Treat the staff owned pets
All should know how the therapy works

Step Three: CREATE INTEREST FROM THE CURRENT CLIENT BASE
Waiting time is client education time!

Step Four: EXAM ROOM OPPORTUNITIES
Step Five: PRESCRIBE LASER THERAPY
Step Six: EDUCATE THE CLIENT
Step Seven: EXPANSION OF SERVICES TO THE CURRENT CLIENT BASE
Geriatric patients. NSAIDS, cortisone and nutraceuticals.
Lick granulomas
Hip dysplasia
Otitis

Step Eight: INCORPORATE LASER THERAPY INTO EXISTING CLINICAL PROCEDURES
Pain management
Rehabilitation program.
Everyday chronic and acute cases:
Otitis
Lick granulomas
Hip dysplasia

Step Nine: TRADITIONAL MARKETING

Step Ten: SOCIAL MEDIA

Step Eleven: OPEN HOUSE/LASER NIGHT

Step Twelve: PUBLIC APPEARANCE
Set up an area for free therapy at a dog show or agility trial.

Step two: TRAIN THE STAFF
1. The therapists
   - Select the right individuals
2. Receptionist/front desk staff
3. The entire hospital
   - All should be made aware of this new technology available

Get everyone excited!
Identify a Laser Specialist
Identify a team leader to take ownership of being a "laser specialist" in your practice, but make sure EVERYONE is on board with practice philosophy.

Start by Treating Staff-Owned Pets
When they see the results for themselves, they will believe in it. When they believe in it, they will have an easier time discussing it with clients.

Staff/Client Communication
Ensure that ALL staff members can give a brief, easy to understand answer to:
"How Does Laser Therapy Work?"
"Laser therapy uses a certain wavelength of light to stimulate the body to heal at the cellular level."
"Similar to photosynthesis, cells accept energy from light in order to accelerate respiration, healing/repair, and produce their own energy."

Step three: CREATE INTEREST FROM THE CURRENT CLIENT BASE
Three events should happen in the waiting room:
1. The clients should be handed a marketing piece and questioned if they are familiar with laser therapy
2. There should be a video playing
3. Place a success photo on the wall or a book of client testimonials

Goal: To create questions from the clients
Waiting time is client education time!

Receptionist Duty During Scheduling
When clients call about a "problem", ask yourself the following:
Does the pet have any pain or discomfort?
Does the pet have any swelling or inflammation?
Does the pet have any lameness or mobility issues?

If the answer is "YES" to any of these questions, the appointment should be flagged "LT" to indicate that laser therapy should be discussed with client/ prompt staff to consider LT use.
Step four: EXAM ROOM OPPORTUNITIES
1. Staff initiates conversation on laser therapy.
2. Successful cases on the wall with photos.
3. Information presented on a DVD.
4. Client education presented on a tablet.

Tips for Reducing Client Resistance:

Fear:
Some clients are skeptical because they have never heard of laser therapy before, even from their doctor or PT after their OWN orthopedic surgeries.

Utilize every opportunity to educate them.

Key phrases:
Laser therapy is a healing modality that works at the cellular level.

We have reached a plateau in the quality of life for your companion, we now have the technology to improve this without any side effects.

“STAR WARS” and photosynthesis analogies.

With permission let them feel the laser.

Step five: PRESCRIBE LASER THERAPY
It has become the standard of care in the veterinary profession.

We have no problem prescribing traditional therapy. We should not hesitate to prescribe laser therapy.

Step six: EDUCATE THE CLIENT
Utilize a tablet or white erasable board.

What the laser will do . . . Handouts.

With their permission, let them feel the laser.

Place the patient through range of motion and a lameness test before and after therapy to illustrate the results to the client.

Create a space where the patient would feel relaxed and less distracted.

Play music that was designed to soothe and calm dogs.

Both clients and patients should enjoy this space.
Step seven: **EXPANSION OF SERVICES TO THE CURRENT CLIENT BASE**

Identify and notify with a personal letter:
- All geriatric patients.
- All patients currently on NSAIDS, cortisone and neutraceuticals.
- Target patients with chronic disorders:
  - Lick granulomas
  - Hip dysplasia
  - Otitis

Step eight: **INCORPORATE LASER THERAPY INTO EXISTING CLINICAL PROCEDURES**

Pain management after routine procedures.
- Pain management and accelerated healing post orthopedics.
- Utilization within any rehabilitation program.
- Include in the protocol for treatment of everyday chronic and acute cases:
  - Otitis
  - Lick granulomas
  - Hip dysplasia

Stepnine: **TRADITIONAL MARKETING**

- Practice website.
- Practice newsletter.
- Invite the local newspaper.
- Have a success story appear on the local news.
- Email blasts to target clients.

**Utilize and Reward Word of Mouth Referrals**

Once clients see that laser therapy is effective for their own pets, word of mouth is the best possible resource for new clients/patients.

Incentivize your clients if they refer someone to you who ends up coming in for laser therapy:
- Coupons towards their pet’s own LT
- Gift cards
- “Patient of the Month” feature in Hospital Newsletter, etc.

Attract new clients and create awareness

Marketing

Step ten: **SOCIAL MEDIA**
Step eleven: OPEN HOUSE/LASER NIGHT
Existing patients, their friends and family.
Potential new clients.
“Grand opening of our new laser therapy center.”

Step twelve: PUBLIC SPEAKING
Local organizations.
Allows explanation of the technology and service to many people at once.
  Dog and pet clubs: 4-H
  Rotary
  Lions
  VFW

Conclusions
Very versatile and effective modality
  Adds state of the art technology and increases quality of care.
New revenue base and increased staff income without cannibalizing other services
Provides:
  Pain relief
  Reduction in inflammation.
  Accelerated healing.

LASER THERAPY IS BECOMING THE STANDARD OF CARE IN VETERINARY PRACTICE

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Veterinary Medical Laser Safety Officer Training
2 CE Credits.
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