

トピックス

Veterinary Low Reactive-Level Laser Therapy (VLRLT)

獣医低反応性レーザー療法 (VLRLT)

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Prof. Albert Einstein established the theoretical foundation of the LASER in his paper *Zur Quantentheorie der Strahlung* (On the Quantum Theory of Radiation) in 1917. Einstein wrote about the concept of light spontaneous emission, and later on the stimulated emission of electromagnetic radiation.

It took years since the theoretical article of Prof. Einstein was printed till Dr. Theodore Maiman (1960) was able to demonstrate physically the first functional laser at the Hughes Research Laboratories, US, a laser that was capable to produce short pulses according to Prof. Einstein theory.

LASER is an acronym of *Light Amplification by Stimulated Emission of Radiation*, wherein *light* broadly denotes electromagnetic radiation. Laser by definition is "any device which can be made, and produce or amplify electromagnetic radiation in the wavelength range from 180nm to 1mm primarily by process of controlled stimulated emission" (EU Standards).

Some additional points must be mentioned here: the LASER radiation has a coherent electromagnetic monochromatic (one wavelength) beam, and it advances in one plain and in one direction and does not diverge. These properties are the reason for the laser strength, and its penetration ability, all leads to laser's many uses in different aspects of our life.

Commonly in a laser there is an atomic excitation that is done in a diode, and as a result uniform wavelength photons are released and forced to exit in one particular direction.

Some of the medical lasers are used for cutting and can reach 300 Watts(W) and even higher, here – in this article we speak about Low Reactive-Level "Soft" "Cold" Laser, a laser that is used medically and not surgically,

therefore with less of a strength, meaning 1-1000 mW.

The medical use of Low Reactive-Level "Soft" "Cold" Laser began due to the works of Prof. Endre Mester from Semmelweis University in Hungary (1967). Prof. Mester experimented with the effects of low reactive-level lasers on the skin, and he checked mainly the laser safety in order to avoid an induction of skin cancer by application of the laser. While applying lasers to the backs of shaven mice, he noticed that the shaved hair grew back more quickly on the treated group compared to the untreated group.

Mester application is known today as *Low Reactive-Level Laser Therapy (LRLLT)* in human medicine, and *Veterinary Low Reactive-Level Laser Therapy (VLRLT)* when it is used for animal benefits.

The technique is also named "Cold Laser Therapy" and "Low-Powered Laser Therapy (LPLT)". The laser has a light source that generates a coherent light of single wavelength of red-beam or near-infrared wavelength in between 600 up to 1,000 nanometers (nm) and from 1 to 1,000 mW.

It was found that the maximal skin penetration of "soft" laser's wavelengths is about of 800-900 nanometers.

LRLLT emits minimal heat, sound, or vibration. Instead of producing a thermal effect, LRLLT acts by a photochemical reaction in the cells (a bio-stimulation process).

What is the biological background behind low reactive-level laser activity in a live animal?

A photochemical effect, an effect comparable to photosynthesis in plants whereby the light is absorbed by a chromophore as chlorophyll and exerts chemical changes.

In animals (as well as in humans) one of the chromophore that exerts chemical changes in the cell is Cytochrome C Oxidase (Cox) in the mitochondria, and it induces an increase in the production of ATP.

The laser physiological effects are:

- 1) An increase in ATP production, and by that producing more energy to the cell.
- 2) A biostimulation process that improves metabolism, and increases the cell metabolism.
- 2) An increase in tissue repair's speed, quality and tensile strength.
- 3) An improved blood circulation and vasodilation, and by that increases blood supply.
- 4) An analgesic effect, and therefore - relieves acute/chronic pain.
- 5) Anti-inflammatory and anti-edematous effects.
- 6) An increase in collagen production.
- 8) An increase of macrophage activity.
- 9) A stimulation of the immune system.
- 10) Alter nerve conduction velocity and by that stimulates nerve function.

More data (and in depth) about the mechanism behind "soft" laser therapy can be found in – "Efficacy of low-level laser therapy" LANCET vol. 374, pp. 1897-1908, December 5, 2009.

In the veterinary world – one can find the first two veterinary publications on VLRLT in two publications in 1983 –

Basko I. "A new frontier: Laser Therapy" in *Calif. Veterinarian* 1983;10:17, and McKibbin L. and Paraschak "A study of the effects of Lasering on Chronic Bowed Tendons at Whitney Hall Farm Limited, Canada" in *Lasers in Surgery and Medicine* 1983;3:55.

In the last few decades veterinary papers were published on the different aspects of LRLT in the neurological, dermatological and musculoskeletal systems, and currently also for dental uses as well as a combination with acupuncture.

In the last four years we began using VLRLT extensively in our veterinary clinics at The Academic College at Wingate Institute, ISRAEL – in small animals (as dogs, cats, exotics) as well as equine and bovine. When we began our work we carried some specific concepts in our mind:

- 1) In the "older" VLRLT sessions the animal and its owner had to come to the veterinary clinic

every 3 days to be treated for weeks. This option was found to be hard for the clients as well as for the animals. We were looking for a possibility that will allow the owner to treat its animal at home without the necessity to come to the veterinary clinic so often. We established a clinical protocol that will allow the client to treat its animal at the convenience of its home/stable/farm twice a day for 6-8 minutes each time for 14 days.

- 2) We were able to find a mobile, and light weight laser (100-200 grams instead of 5-15 kgs in older time). The laser has a re-chargeable modality with batteries that will give at least 5 hours of operation time after charging at the clinic. Also, the use of the laser should be easy to the operator as well as to the clinician's team that has to explain the laser operation to the owner.
- 3) As far as safety – we need to have a type 1 laser, means – no need for specific protective goggles, and easy to explain the safe use of the laser (avoid reflection into owner's and animal's eyes, avoid low abdominal area in a pregnant animal).
- 4) The laser will be leased to the owner to the term of the therapy in a feasible cost.
- 5) The laser emission area should be broad enough to cover at least 1 sq cm and by that avoiding the need to a pin-point radiation, a task that will be hard to perform by the owners.
- 6) Once every week or two weeks the animal should be re-evaluate by the clinician.

The "soft" laser that fits our needs (see above) is B-CURE LASER LLLT808.

Our routine protocol is application of VLRLT by the owner twice a day for 14 days, and each application is done for 6-8 minutes.

Evaluation of the animals is done before, after 7-14 days (or less if needed).

Our experience so far in using the mobile vlrt unit:

1. Neurological deficits - a complete recovery of facial paralysis in 5 dogs cases out of 7; a complete recovery of 7 dog cases of vestibular syndrome (out of 8); and 5 out of 6 cases of radial nerve paralysis in cats. We are using it for any case of IVDD as part of a more complex protocol. (図 1, 2)

2. Musculoskeletal disorders as joint disorders/ arthritis/arthrosis – as a routine practice we apply nowadays for every dog with hip dysplasia or elbow arthrosis LRLLT. In 32 dogs we could stop giving any other drugs that were given in the past (e.g. Carprofen/Rymadyl or Etodolac/Etogesic). (Fig 3 ~ 5)
3. Dermatological conditions – we treated 48 dogs and cats for psychogenic dermatosis (as acral lick granuloma) and all of them stopped within three days of therapy the self-mutilation behavior. (Fig 6, 7) Routinely all animals that had any surgery in our clinics have the option to add LRLLT for their wound healing. We did numerous sessions using the LRLLT for wound healing and it seems that recovery time was reduced by 30%. (Fig 8)
4. Dental diseases - feline stomatitis-gingivitis-faucitis syndrome – in this severe cat syndrome we had 5 cats that had steroids injection every 2 weeks, by the end of the therapy we could

reduce the steroid injections for once every 18 weeks and more (5/5).

5. Myofascial pain syndromes – all treated animals (8 dogs, 6 cats and 4 horses) had a great improvement in their condition according to their owner and clinician evaluation.



Fig 3 horse getting laser therapy for hock problem



Fig 1 Dr. Sagiv Ben-Yakir apply laser with acupuncture to Radial nerve paralysis in cat



Fig 4 Dr. Sagiv Ben-Yakir's student treat a cow with hock problem



Fig 2 -Dr. Sagiv Ben-Yakir apply laser with acupuncture to Ulnatnerve paralysis in cat



Fig 5 Dr. Sagiv Ben-Yakir's student treat a cow with back problem

We are still investigating LRLLT in different animals for different conditions, but our conclusion so far according to the literature and our own experience is that we do support Evidence Base Medicine that indicated that the LRLLT is clinically effective in the following diseases: facial paralysis, vestibular syndrome,

radial nerve deficits, IVDD, hip dysplasia and elbow arthrosis, psychogenic dermatosis, feline stomatitis-gingivitis-fauces syndrome, and myofascial pain syndromes (e.g low back pain, neck/upper back pain, muscle pain etc.).



図 6 Cat with skin problem having laser + acupuncture



図 8 Application of laser for quick healing of surgical wound



図 7 Cat with skin problem having laser + acupuncture