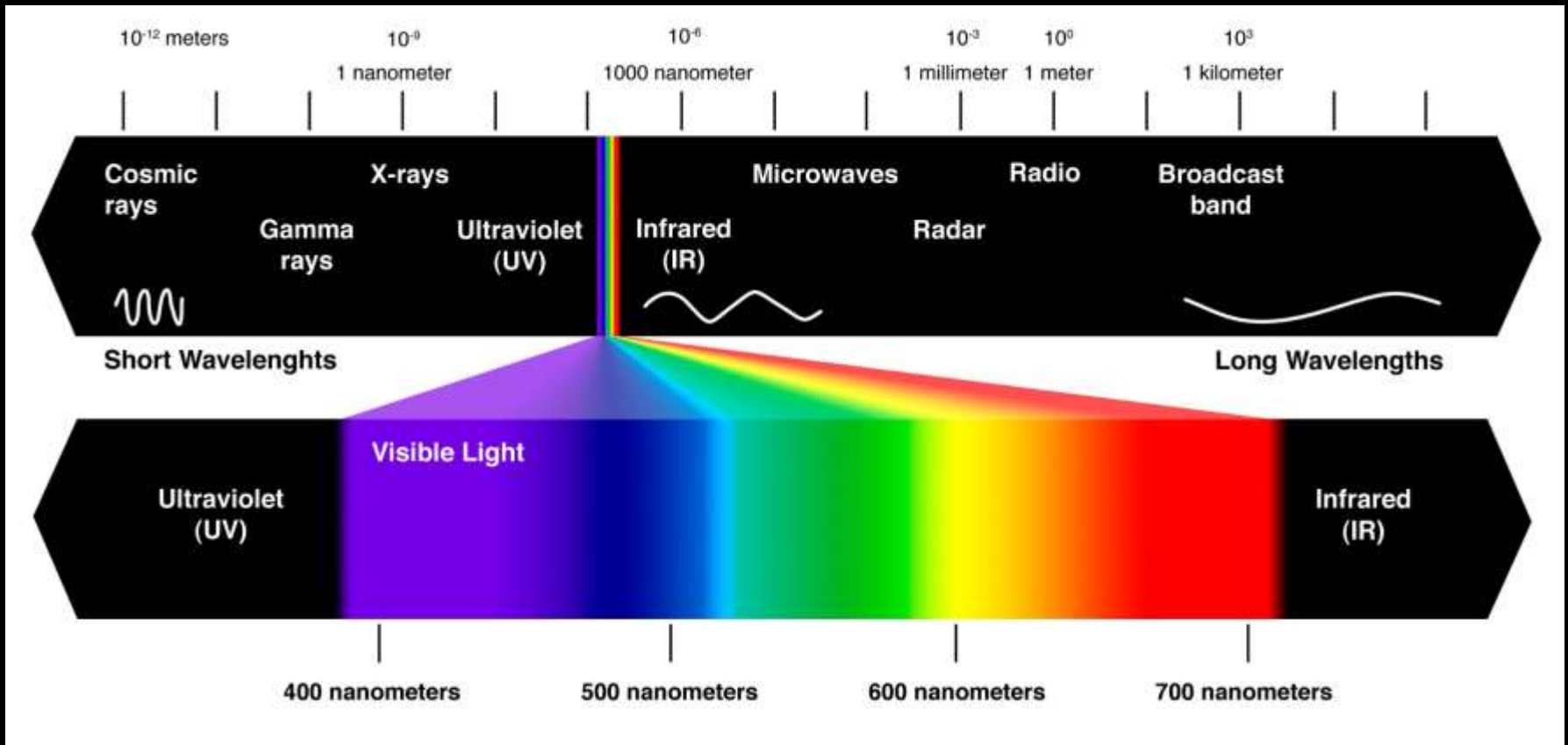




THE LASER CRAZE:

WHAT'S THE EVIDENCE FOR
LOW-LEVEL LASER?

WHAT IS LOW-LEVEL LASER?



“Cold” laser typically 600-1100nm wavelength

WHAT IS LOW-LEVEL LASER?

- Wavelength
 - Absorption, physiologic effects
 - Penetration
 - 600-1100nm
- Dosage
 - J/sq cm
- Irradiance
 - W/sq cm
- Power
 - 5-500mW
Class III
 - >500mW
Class IV (not “Low-level”)



WHAT CAN LASER DO?

- Multiplicity of biologic effects (photobiomodulation)
 - Stimulates cytochrome-c oxidase and increase production of ATP
 - Stimulates NO release leading to local vasodilation and effects on cellular metabolism
 - Stimulates oxidation and ROS production, which can influence protein synthesis, stem-cell differentiation, etc.
 - May stimulate angiogenesis
 - Stimulates lymphocyte and macrophage proliferation

WHAT CAN LASER DO?

- Improve wound healing
- Reduce inflammation
- Reduce pain
- Treat allergies, infection, arthritis, FIC, cancer, epilepsy, Cushing's disease, hypothyroidism, sepsis, etc...
- “Energizes” cells
- Laser acupuncture
 - Qi stagnation

WHAT'S THE EVIDENCE?

Systematic reviews, EBM guidelines, CATs

Synthetic Literature

RCTs, other designs, case reports, pre-clinical, human studies

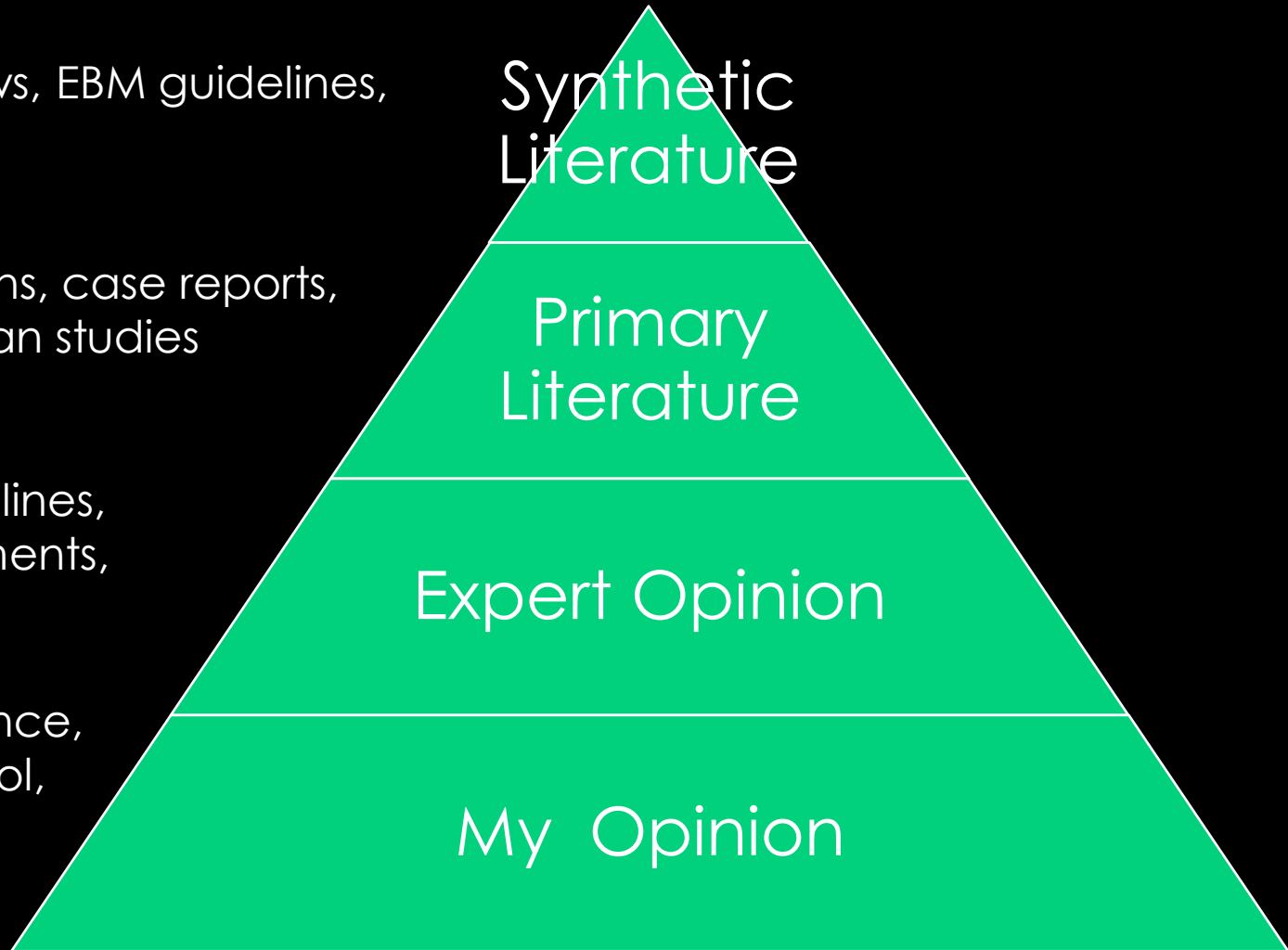
Primary Literature

CE, clinical guidelines, consensus statements, textbooks

Expert Opinion

personal experience, colleagues, school, CE, ????????????

My Opinion



WHAT'S THE EVIDENCE?

Veterinary Systematic Reviews

None

Veterinary Clinical Studies

- A handful of studies
- Heterogenous indications and LLLT techniques
- Significant limitations
 - Small numbers of subjects
 - Often not blinded, randomized, placebo-controlled
- Variable and conflicting results

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- IVDD

Williams CC, Barone G. **Is Low Level Laser Therapy an Effective Adjunctive Treatment to Hemilaminectomy in Dogs with Acute Onset Paraplegia Secondary to Intervertebral Disc Disease?** Proceedings, American College of Veterinary Internal Medicine Forum, Denver, CO. June, 2011.

Draper WE, Schubert TA, Clemmons RM, et al. **Low-level laser therapy reduces time to ambulation in dogs after hemilaminectomy: a preliminary study.** J Sm Anim Pract 2012;53(8):465–469.

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- IVDD

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Results of the study revealed that treatment with LLLT...did not shorten or improve recovery times for dogs with acute onset paraplegia secondary to IVDD after hemilaminectomy procedures....LLLT did not appear to have an effect on [prolonged recovery time or failure to recover].

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- IVDD

Draper WE, Schubert TA, Clemmons RM, et al. **Low-level laser therapy reduces time to ambulation in dogs after hemilaminectomy: a preliminary study.** J Sm Anim Pract 2012;53(8):465–469.

Low-level laser therapy in combination with surgery decreases the time to ambulation in dogs with T3-L3 myelopathy secondary to intervertebral disk herniation.

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- IVDD

- Blinding? Randomization?
- Small number of subjects
- Different treatment protocols
- All dogs recovered eventually to same extent

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Skin Conditions

Olivieri L, Cavina, D, Radicchi, G. et al. **Efficacy of low-level laser therapy on hair regrowth in dogs with non-inflammatory alopecia: a pilot study.** Veterinary Dermatology 2015;26(1):35-e11.

Stich, A. N.; Rosenkrantz, W. S.; Griffin, C. E. **Clinical efficacy of low-level laser therapy on localized canine atopic dermatitis severity score and localized pruritic visual analog score in pedal pruritus due to canine atopic dermatitis.** Veterinary Dermatology, 2014, 25, 5, pp 464-e74

WHAT'S THE EVIDENCE?

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Veterinary Dermatology 2015;26(1):35-e11.

Our clinical and histological data document promising effects of LLLT on hair regrowth in CNA.

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Skin Conditions

Stich, A. N.; Rosenkrantz, W. S.; Griffin, C. E. **Clinical efficacy of low-level laser therapy on localized canine atopic dermatitis severity score and localized pruritic visual analog score in pedal pruritus due to canine atopic dermatitis.** *Veterinary Dermatology*, 2014, 25, 5, pp 464-e74

Low-level laser therapy is not an effective localized treatment for pedal pruritus in canine atopic dermatitis.

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Skin Conditions

- Significant methodological limitations
- Different conditions and treatment protocols

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Wound Healing

- 14 studies
 - 1976-2015
 - Various species
 - Dogs- 4
 - Horses- 3
 - Cattle- 3
 - Pigs- 1
 - Cats- 1
 - Sheep- 1
 - Rabbit- 1
 - Excluded rodents, reptiles
 - Excluded case reports/series

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Wound Healing

- 14 studies
 - Mostly experimental, not clinical patients (10 exp, 4 unclear)
 - Very international journals
 - India- 4
 - US- 3
 - Brazil- 2
 - Netherlands- 1
 - China- 1
 - Poland- 1
 - Canada- 1
 - UK- 1

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Wound Healing

- 14 studies
 - Heterogenous patients, indications, treatment protocols, outcome measures
 - Variable but generally high risk of bias
 - Small number of subjects
 - Lack of blinding, randomization
 - Subjective, inconsistent outcome measures
 - OVH incisions healed in 10 days
 - “Spin”
 - 1 study found no difference between groups, claimed this proved “systemic effect” of laser therapy

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Wound Healing

- 8/14 reported beneficial effects
 - Species
 - 2/4 dogs
 - 0/3 horses
 - 3/3 cattle
 - 1/1 pigs
 - 1/1 cats
 - 1/1 sheep
 - 0/1 rabbit
 - Country
 - India- 3/4
 - US- 1/3
 - Brazil- 1/2
 - Netherlands- 1/1
 - China- 1/1
 - Poland- 1/1
 - Canada- 0/1
 - UK- 0/1

WHAT'S THE EVIDENCE?

Veterinary Clinical Studies- Wound Healing

- 8/14 Positive Studies (57%)
 - US, UK, Canada- 1/5 (20%)
 - Other- 7/9 (78%)

Vickers A, Goyal N, Harland R, et al. **Do certain countries produce only positive results? A systematic review of controlled trials.** *Controlled Clinical Trials* 1998;19:159–166.

Of trials published in England, 75% gave the test treatment as superior to control. The results for China, Japan, Russia/USSR, and Taiwan were 99%, 89%, 97%, and 95%, respectively. No trial published in China or Russia/USSR found a test treatment to be ineffective.

WHAT'S THE EVIDENCE?

Human Synthetic Evidence

- Hundreds of systematic reviews
- Heterogenous indications, treatment protocols, analyses, results
- Often conclude insufficient evidence for definitive conclusion
- Cherry picking rampant on both sides of the debate

WHAT'S THE EVIDENCE?

Human Synthetic Evidence

Aetna-last updated 10/2015

- Aetna considers cold laser therapy...experimental and investigational...because there is inadequate evidence of the effectiveness
- Although the results from large, uncontrolled, open trials of low-energy lasers in inducing wound healing have shown benefit, controlled trials have shown little or no benefit.
- Recent well-designed, controlled studies have found no benefit from low-energy lasers in relieving pain in rheumatoid arthritis or other musculoskeletal conditions. Furthermore, although positive effects were found in some earlier studies, it was not clear that the pain relief achieved was large enough to have either clinical significance or to replace conventional therapies.

WHAT'S THE EVIDENCE?

Human Synthetic Evidence

Cigna-last updated 7/2015

Low-level laser therapy (LLLT) has been proposed for a wide variety of uses...There is insufficient evidence in the published, peer-reviewed scientific literature to demonstrate that LLLT is effective for these conditions or other medical conditions.

WHAT'S THE EVIDENCE?

Human Synthetic Evidence

Clinical Practice Guidelines

- Recommended for prevention of radiation-induced mucositis and Tx of rheumatoid arthritis
- Consider for plantar fasciitis and Achilles tendinopathy
- Not recommended for venous leg ulcers, carpal tunnel, low-back pain, tennis elbow
- Most uses not independently evaluated
- Beware GOBSAT guidelines and expert opinion

WHAT'S THE EVIDENCE?

Pre-clinical Evidence

Lab Animal Studies

- Many studies
- Heterogenous techniques, indications, outcome measures, results
- Applicability to clinical patients?

WHAT'S THE EVIDENCE?

Pre-clinical Evidence

Lab Animal Studies- Synthetic Evidence

Tajali, SB. MacDermid, JC. Houghton, P. et al. **Effects of low power laser irradiation on bone healing in animals: a meta-analysis.** Journal of Orthopaedic Surgery and Research 2010, 5:1

Lucas, C. Criens-Poublon, LJ. Cockrell, CT. et al. **Wound healing in cell studies and animal model experiments by Low Level Laser Therapy; were clinical studies justified? a systematic review.** Lasers Med Sci. 2002;17(2):110-34.

WHAT'S THE EVIDENCE?

Pre-clinical Evidence

Lab Animal Studies- Synthetic Evidence

Tajali, SB. MacDermid, JC. Houghton, P. et al. **Effects of low power laser irradiation on bone healing in animals: a meta-analysis.** Journal of Orthopaedic Surgery and Research 2010, 5:1

While conclusions are limited by the low number of studies, there is concordance across limited evidence that laser improves the strength of bone tissue during the healing process in animal models.

WHAT'S THE EVIDENCE?

Pre-clinical Evidence

Lab Animal Studies- Synthetic Evidence

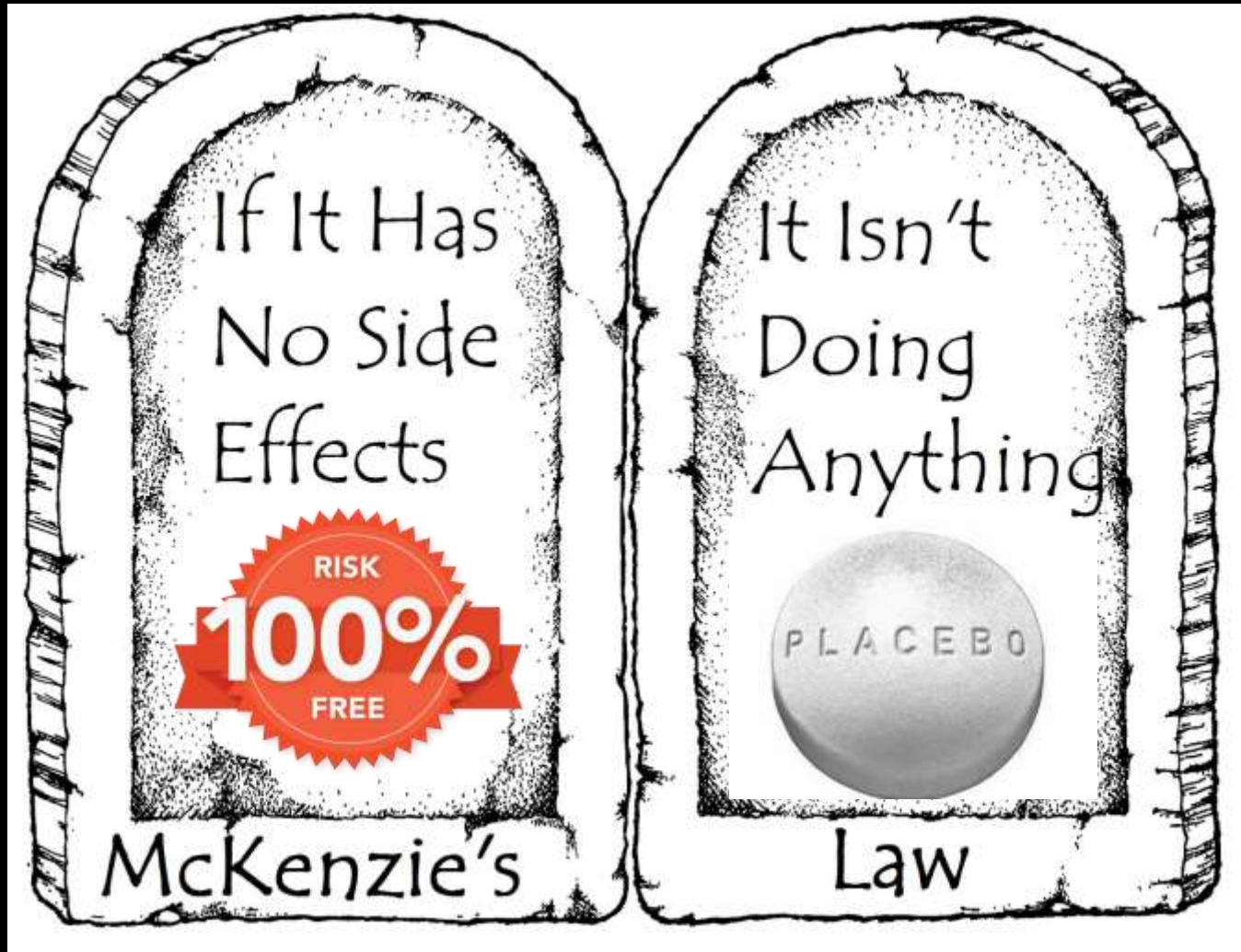
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Summarising the data of cell studies and animal experiments...these studies failed to show unequivocal evidence to substantiate the decision for trials with LLLT in a large number of patients. In fact, there were no differences between the results of these experiments and clinical studies...We conclude that this type of phototherapy should not be considered a valuable (adjuvant) treatment for this selected, generally therapy-refractory condition in humans.

IS LASER THERAPY SAFE?

- Few adverse effects have been reported in clinical trials
- Some heat injury can occur, especially with higher-powered lasers
- Some animal model evidence excessive doses might have negative effects
- Some risk to staff, clients, and patients
- Paucity of evidence means we don't really know much about effects, good or bad
- Assumption is often benefits with no risks

IS LASER THERAPY SAFE?



BOTTOM LINE

- Lasers have significant measurable effects on living tissues in laboratory experiments, so it is plausible that they might have clinical benefits.
- Extensive research done in humans, however, has so far only found limited evidence to support the use of lasers in a few conditions
- The experimental evidence in veterinary species is mixed and low quality, and there are no high-quality published clinical trials validating laser therapy for specific indications.
- Promising but nearly all claims as yet unproven

BOTTOM LINE

- What should we do?
 - Accept uncertainty
 - Be honest with clients
 - Be careful