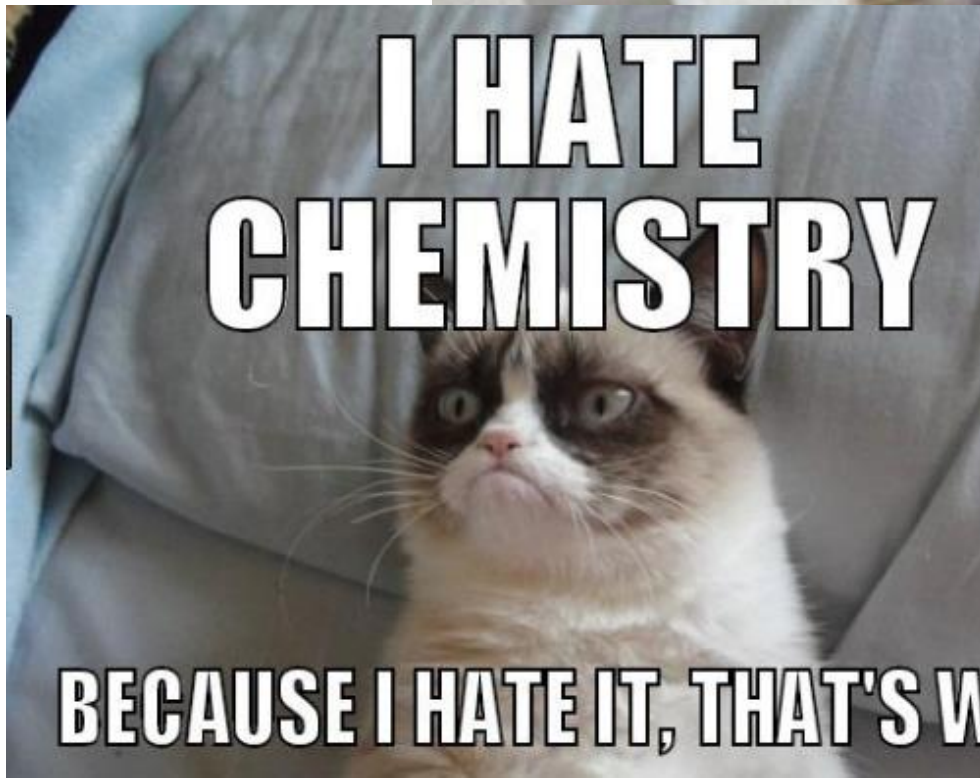
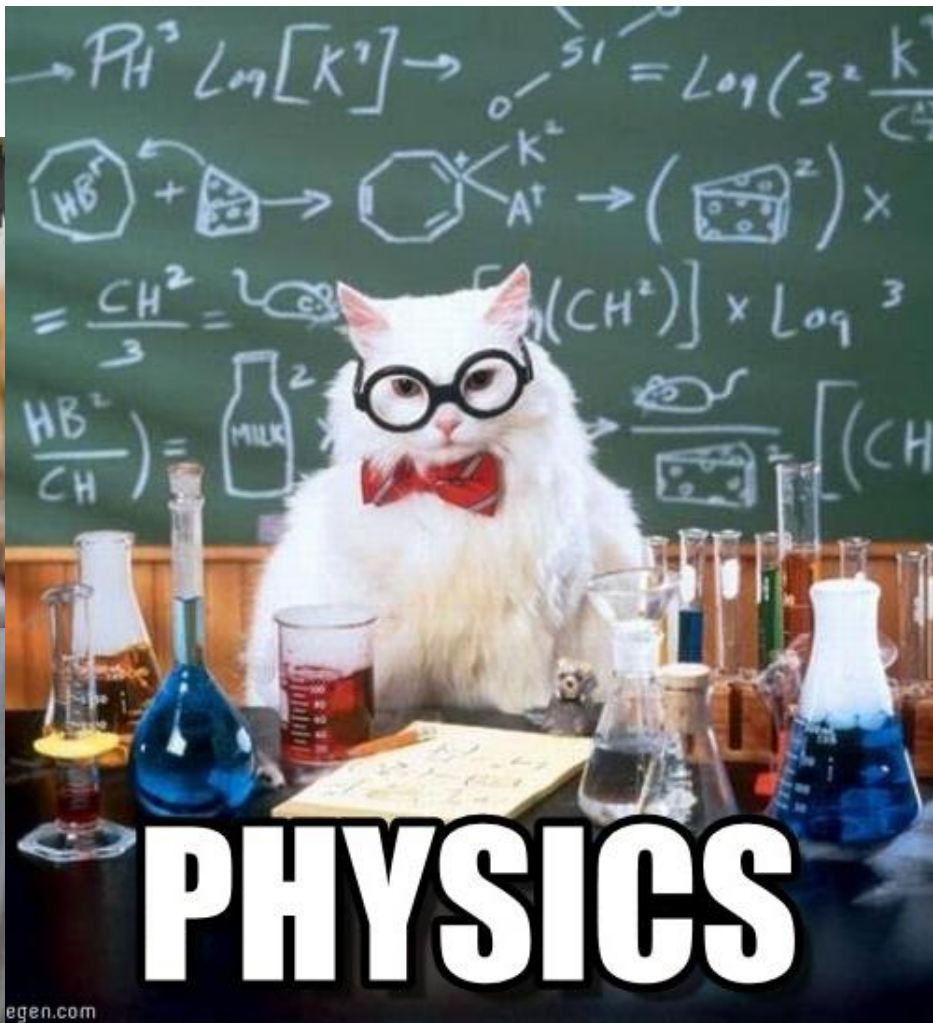
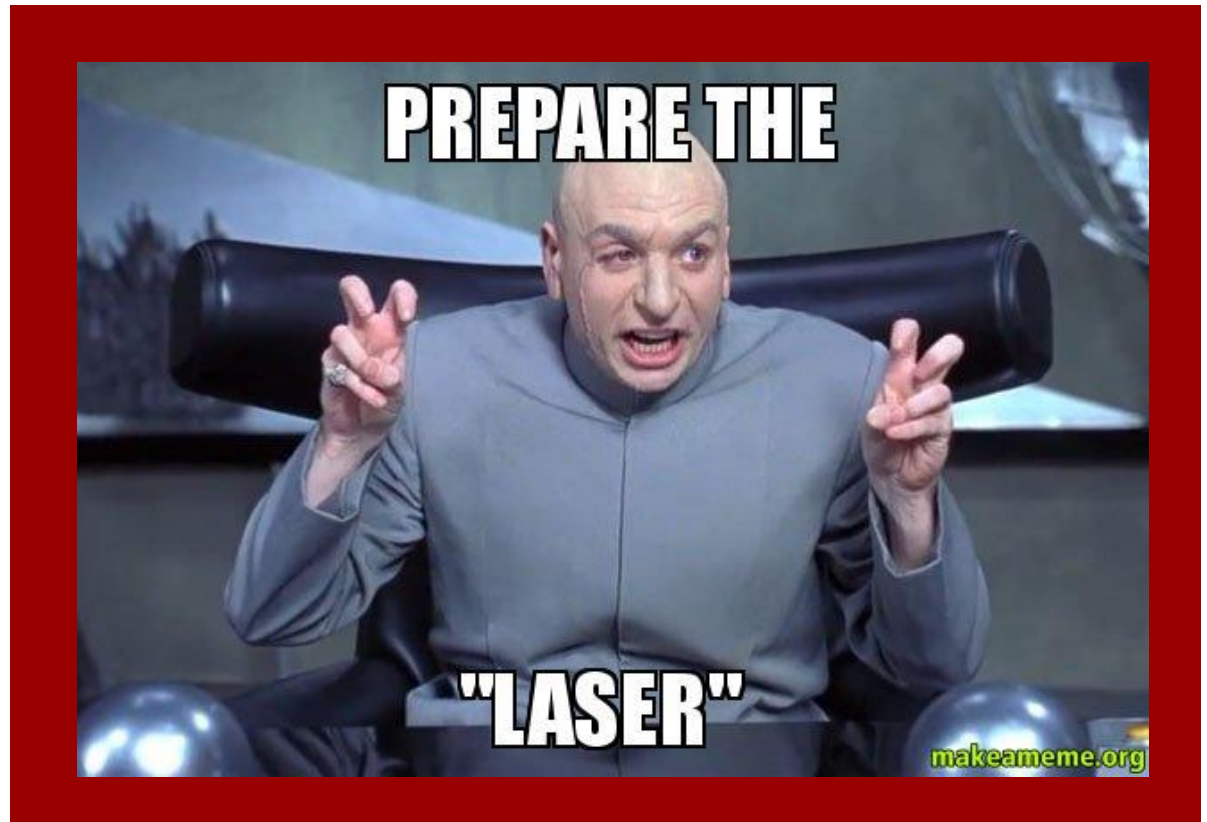




Laser and Pulse Electromagnetic Field Therapies

By Jenna MacDonell, DVM,CVA





Laser Therapy

Surgery vs Therapy

Surgical Lasers

- Photoablative/Phototherma
- Destroy and cut
- Power
 - $>1000\text{W}/\text{cm}^2$
- Narrowed beam with small spot size



Therapeutic Lasers

- Photomodulative/Photochemical
- Stimulate and heal
- Power
 - $<10\text{ W}/\text{cm}^2$
- Diffuse beam with large spot size

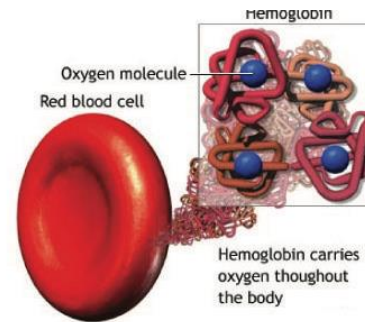
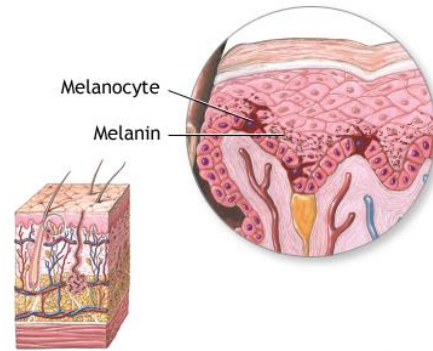
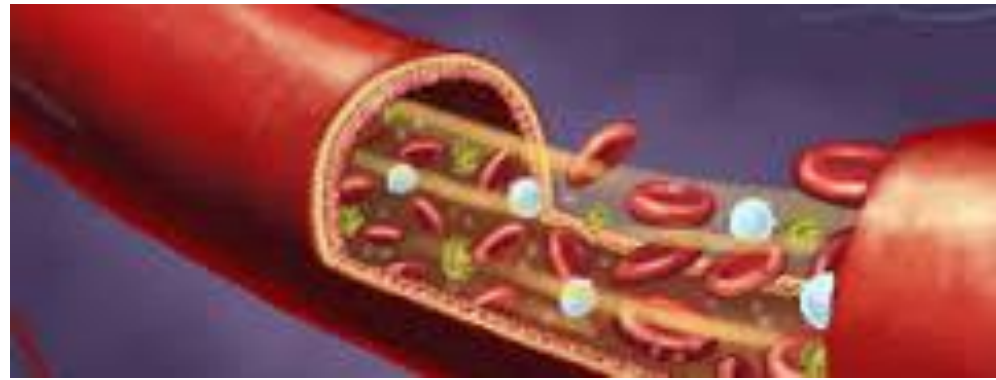
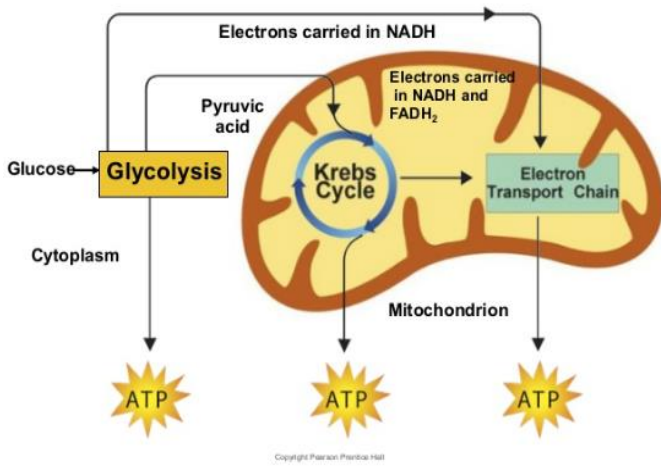




Important things to know

- Wavelength
 - Color of the light (infrared)
 - Refers to depth of penetration and cellular targets
- Power
 - Brightness of the light
 - Refers to dosage of light delivered to a certain depth and the rate at which the energy is delivered
 - Higher power means more energy over less time
- Circulation depends on pressure and thermal gradients





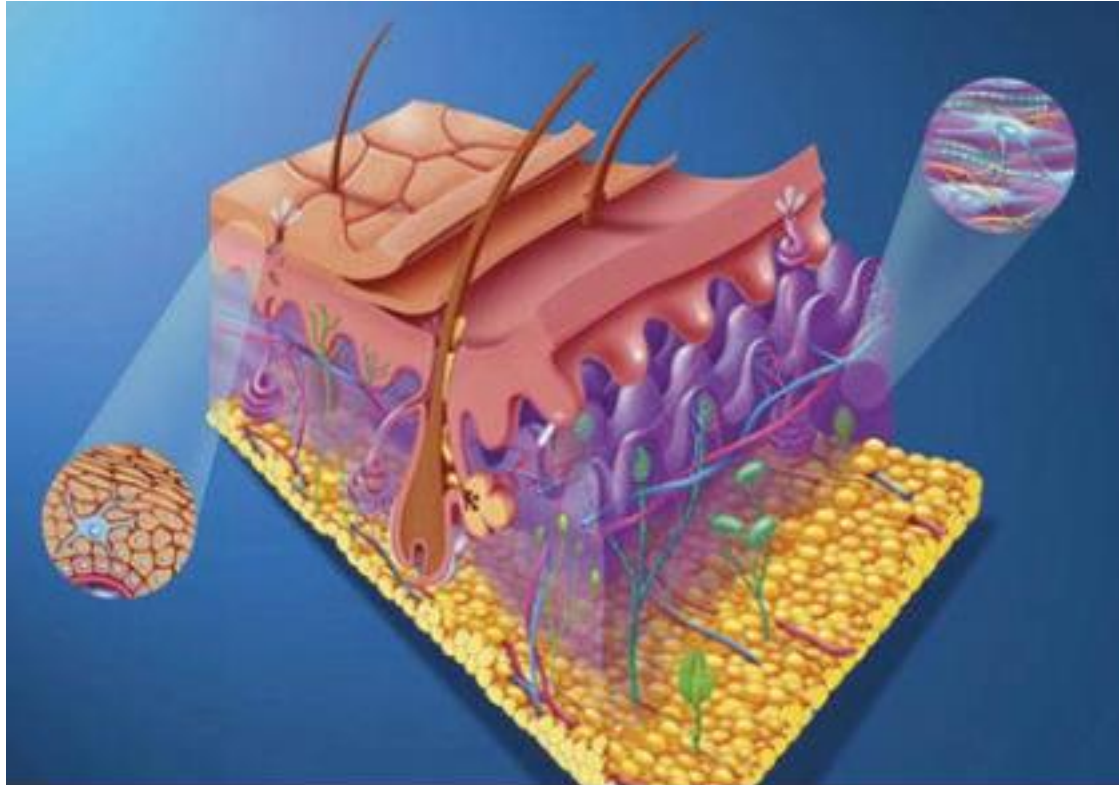
ADAM

Cellular Targets

Chromophores (tissues that absorb light)

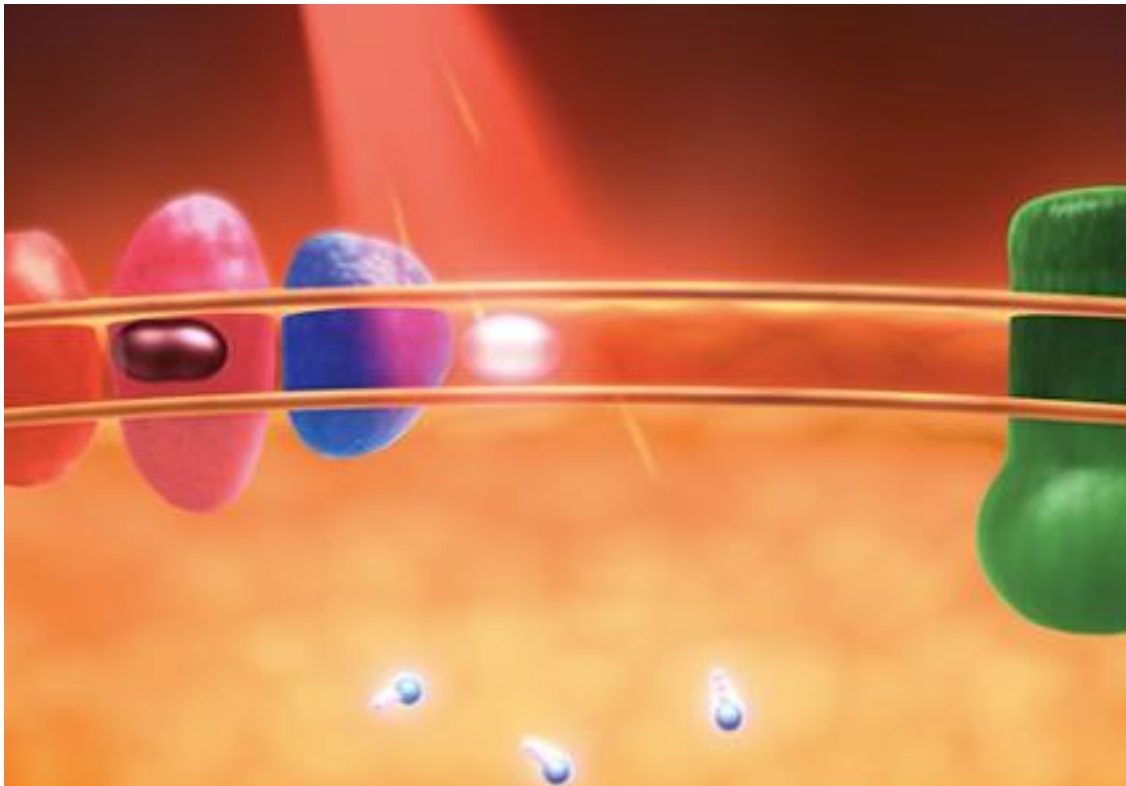
- Melanin
- Hemoglobin
- Enzymes
- Water

Melanin



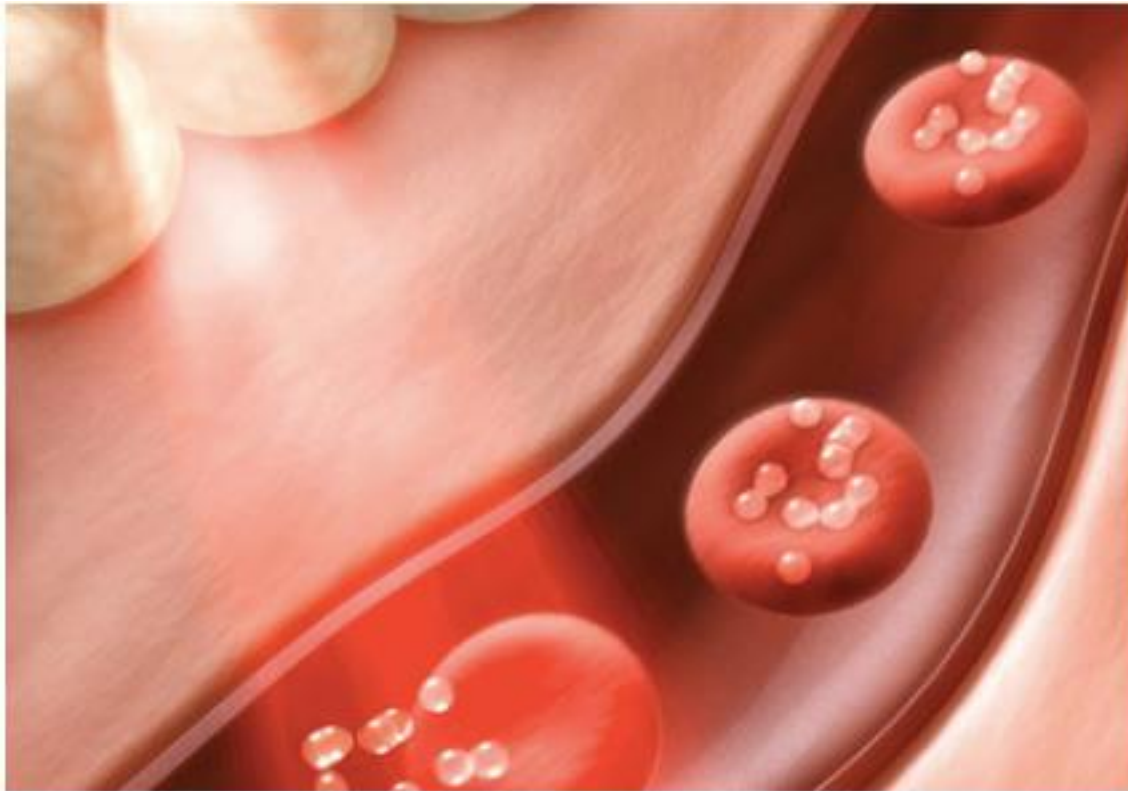
- 660 nm; infrared
- Light inhibits bacteria and promotes cell growth
 - Great for wound healing
 - Scar tissue regulation

Enzymes



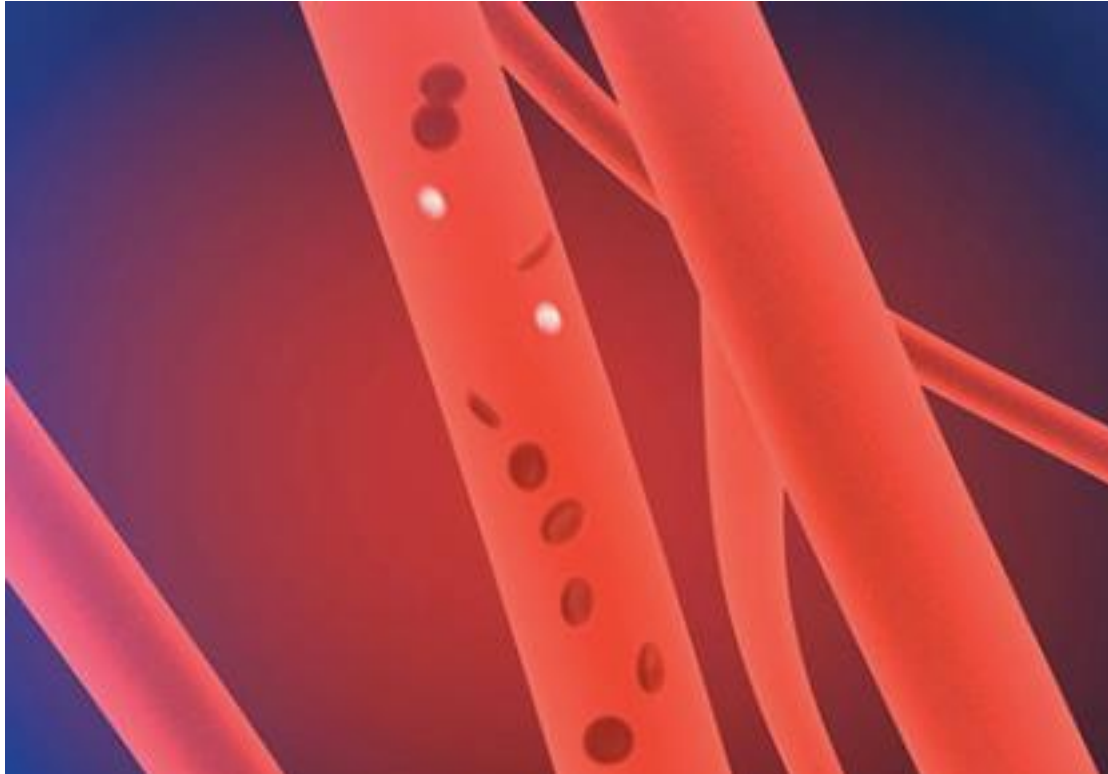
- 800nm; infrared
- Cytochrome oxidase is a key player in converting O₂ into cellular energy
- More cellular energy means the body can heal faster!

Hemoglobin



- 905nm; infrared
- Hemoglobin absorbs laser light and speeds up the process at which the RBCs drop off O₂ to cells
- Cells need O₂ to make energy to heal

Water



- 970nm; infrared
- Circulation is primarily how laser therapy works
 - Heat is generated which increases circulation
- Blood carries O₂ to tissues and carries waste (CO₂ and lactic acid) away
- Ultimately, increasing blood flow increases healing time

How it works- the summary

■ Cellular Effects

- Infrared laser light interacts with cells within tissues to improve the transport of nutrients, which increases the production of cellular energy allowing for faster healing

■ Therapeutic Effects

- Creates an optimal healing environment
- Increases circulation → draws water, oxygen, and nutrients to the damaged area
- Reduces inflammation, swelling, muscle spasms, stiffness, and pain



Uses

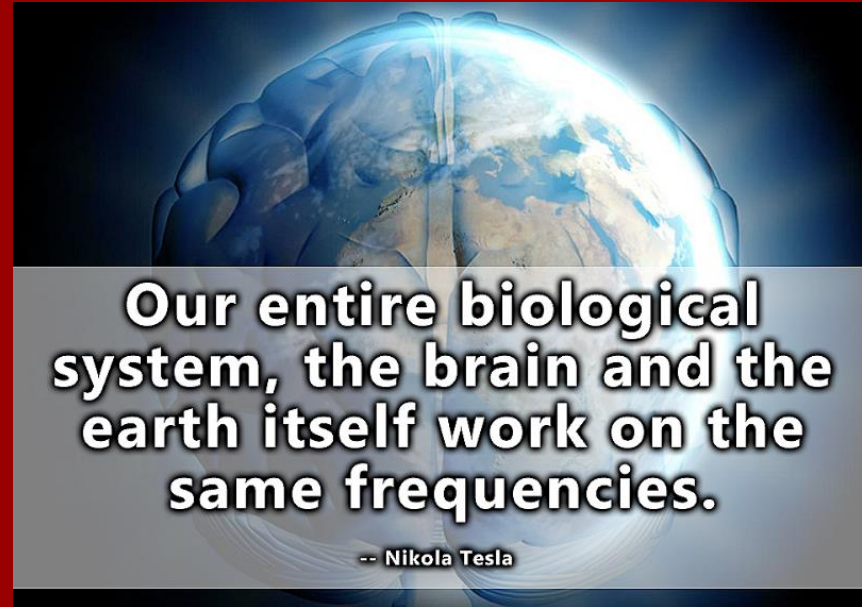
- Pain reduction
- Anti-inflammatory
- Wound healing
- Antimicrobial
- Range of motion



K-Laser Treatments



- Acute conditions
 - Can treat daily, especially if very painful
 - 4 to 6 treatments may be sufficient; depends on condition
- Chronic conditions
 - Respond better when treatments are received 2 to 3 times a week, tapering to once a week or once every other week
 - May require 6 to 12 (or more) treatments; depends on condition and chronicity
- Each treatment is cumulative and results are often seen after 3 or 4 sessions



Our entire biological system, the brain and the earth itself work on the same frequencies.

-- Nikola Tesla

Pulsed Electromagnetic Fields (PEMF)

How does it work?

- PEMFs use low-level energy pulses to reduce inflammation and promote self healing by:
 - Increasing blood flow
 - Causing muscle relaxation
 - Healing bone
 - Better blood oxygenation
- Great! But *how*?



The “how”

- **Key Players:**

- Calcium (Ca)
 - Molecule
- Calmodulin (CaM)
 - Receptor
- Nitrous Oxide (NO)
 - Product
 - Further actions



- **Key Points:**



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tPEMF™



tPEMF increases Ca^{2+} binding to CaM in milliseconds



Ca^{2+}CaM binds to cNOS, catalyzes NO release instantaneously increasing blood and lymph flow.

Pain and Edema decrease in seconds

NO → cGMP → Growth Factors

FGF-2/VEGF Angiogenesis (hours/days)

TNF- α Collagen/Granulation (days)

TGF-B Remodeling (days/weeks)

Uses

- Post-operative, post-trauma and chronic pain relief
 - Acute vs Chronic
- Wound Care
- Neurologic issues
 - Wobblers, lumbar stenosis, myelitis
- To reduce need for/ amount of narcotics
- Studies: TBI, DJD, cognitive disorders, cardiac and cerebral ischemia
- Dogs and cats!



Available PEMFs

- Beds/ mats
 - Response Systems
- Loops
 - Asisi loops



ASISI LOOPS

- Not all PEMF systems deliver the same dose to the NO signaling cascade.
 - Assisi's tPEMF signal delivers the largest effective dose
 - Suggests that other PEMF devices may not reduce inflammation or pain as quickly/effectively
- Not adversely affected by bandages, casts or orthopedic implants
- Place directly on the animal or use jackets

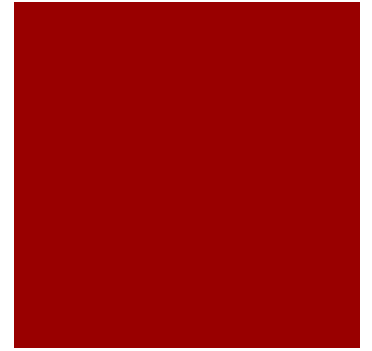


ASISI LOOPS

- Recommended usage: 15 minute sessions 2-4x daily
 - Acute: anywhere from 48 hours – 2 weeks
 - Chronic: 2-4 weeks; taper treatments
- Assisi 2.0 has at least 150 sessions/device
 - \$1.7/treatment!
 - Recycle at electronic stores when finished
- Choosing a size
 - Treatment depth is 2/3 the diameter of the device
 - Ex: 7.5" loop has treatment depth of ~5" and width of about 3-4" side to side
- Can be used same day as laser or acupuncture



Questions?



References

- Electromagnetic Fields in Biology and Medicine
by Marko S Markov
- Assisiloop.com and Responsesystems.com
- K-laser.com
- Google images

