What is a “cold” laser

• Laser is a monochromatic beam of light.
  (Red and Infra-Red are most commonly used)

• To be classified as a true laser there are three (3) criteria which must be met;
  It must be monochromatic – one color
  It must be collimated.
  It must be coherant.
Monochromatic

Essentially the “light waves” are all the same length....
Collimated means...

Focusing the beam of light....
Coherent

• They are in “sync” or all the same...

As opposed to not in sync....
Eeuuuwww....

These would actually be beams of different color....
Some history.....

While trying to destroy tumors in lab rats, a Hungarian physician named Endre Metser discovered that lasers at lower level could not destroy the tumors, but he noticed that the surgical incisions healed faster in the rats treated with laser than those rats that didn’t receive the laser treatment.

Lower level laser therapy (LLLT) is very beneficial in healing wounds!!
So...

The lower the wavelength the more superficial the healing. A 600-700nm wavelength heals the surface wounds..

According to the work of Mester, the lower wavelengths heal more superficial type wounds. It is estimated that the depth this light reaches is about 1cm

This treatment would be beneficial for things like:

- Diabetic ulcers or bed sores
- Surgical incision sights

Etc.....
The higher the wavelength the deeper it heals. A beam that measures 700-1000nm is not as easily absorbed by the epidermis (skin). Tendons, muscles and ligaments are deeper...right?

But... there’s more.....
Power is the rate by which the energy is produced (watts).

The power of Low Level Light Therapy (LLLT) devices is measured in mW (milliwatts)
Typically this is <500 mW

TREATMENT PARAMETERS..
- Wavelength (nM)
- Power (mW)
- Treatment time (sec or min)
- Energy density J/cm^2
- Continuous or pulsed

Does any of this sound familiar??
Therefore...

Watts $\times$ Seconds $=\text{Joules}$

Other things to consider:
- Beam size
- Frequency
- Power Density

Most of the time the laser device will calculate the needed parameters if you – the clinician – tell it how much energy you want delivered.

SO.....
So...

<table>
<thead>
<tr>
<th>m / W</th>
<th>X Rx Time(sec) = Joules</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>(0.05) 80 4</td>
</tr>
<tr>
<td>100</td>
<td>(0.1) 40 4</td>
</tr>
<tr>
<td>500</td>
<td>(0.5) 8 4</td>
</tr>
</tbody>
</table>

Energy density = RX time X Power ÷ the beam size (similar to ultrasound transducer)  

\[ J / \text{cm}^2 \]
To pulse or not to pulse... that is the question

**Expert Opinion on Pulsed LLLT**

“In the literature there are many examples showing that different pulse frequencies give different biological effects. However, although research clearly shows pulsing is of importance, there is little knowledge about the clinical implication of specific pulse frequency.”
Professor Jan Tuner

What does this have to do with us?!?!

Certain molecular changes within the cells, namely the inhibition of production and secretion of many inflammatory agents like cytokines, prostaglandins and others.

LLLT has been shown in studies to reduce these inflammatory agents in rheumatoid arthritis as well as some different musculoskeletal disorders. The exact dosages/parameters for these effects are more widely documented in animal studies. However other human studies have shown that using LLLT to reduce inflammation is similar to the use of pharmacological agents (NSAIDS) without the side effects. The parameters are
What is cold laser therapy good for?

• Increase in cell metabolism / production of ATP
• Signals release of growth factor
• Blocks depolarization of C fibers – (endogenous opiate!)
• Collagen production (Fibroblasts)

• Used in the treatment of wounds
• Treat musculoskeletal pain.
WARNING: LLLT CAN DAMAGE OPTIC TISSUE!!

Protective eyewear should always be worn by the clinician and the patient during treatment. Other contraindications include; over active carcinoma, hemorrhagic areas, local to endocrine glands.
Of Course...................

Without the initial discovery by Dr. Mester, we would not realize that LLLT is a viable modality for the treatment of wounds.

As Barbara has told us the only musculoskeletal problem for which LLLT is approved is carpal tunnel syndrome.

So much more research needs to be done to provide “best practice” based therapy concerning LLLT.

THE END!  (TA DA!)