NEAR INFRARED LED THERAPY in the MANAGEMENT of PAIN

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WHY
LIGHT-EMITTING
DIODES (LEDs)?
Phototherapy Light Sources

Flashlamp Technology (IPL)
- $\text{Wide waveband} ; ; ; \text{Medium area}$

NSR Laser systems
- $\text{Single wavelength} ; ; ; \text{Small area}$

Laser Diodes (Laser therapy systems)
- $\text{Single wavelength} ; ; ; \text{Small area}$

Light-emitting Diodes (LEDs, SLEDs)
- $\text{Very narrow waveband} ; ; ; \text{Large area}$
The FIRST LAW of PHOTOBIOLOGY

NO ABSORPTION ...

..... NO REACTION
What is the prime determinant of
Target selection (chromophore?)
Depth of penetration?
From: Smith KC.  
*The Science of Photobiology*  
Choose the optimal WAVELENGTH

To reach and involve the TARGET
PHOTOTHERAPEUTIC WAVELENGTH-SPECIFIC ACTIONS IN RAISING ACTION POTENTIALS OF SPECIFIC CELLS

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>Cell Types/Action Level</th>
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<tbody>
<tr>
<td></td>
<td>Mast</td>
</tr>
<tr>
<td>963± 9:3</td>
<td>++</td>
</tr>
<tr>
<td>&lt;3</td>
<td>++</td>
</tr>
<tr>
<td>63± 8:3</td>
<td>++</td>
</tr>
<tr>
<td>&lt;37</td>
<td>–</td>
</tr>
<tr>
<td>4±97</td>
<td>B</td>
</tr>
<tr>
<td>43±33</td>
<td>B</td>
</tr>
</tbody>
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Cell Types: Mast, Neutrophil, Macrophage, Fibroblast, Fibro-Myo, Keratinocyte.
Pain Control with Phototherapy

Endorphin synthesis
(Endogenous Morphine)
Narcotic autoanalgesia

Plasma ACTH and β-endorphin levels in response to low level laser therapy (LLLT) for myofascial trigger points.
Laser Therapy, 6: 133-142.
Pain Control with Phototherapy

**Endorphin synthesis**
*(Endogenous Morphine)*
*Narcotic autoanalgesia*

**Enkephalin synthesis**
*Non-narcotic autoanalgesia*
pain (nociceptive impulse)

neurotransmitter vesicles (algeassic substance)

enkephalins of muscular and neural origin build up in and physically block synaptic cleft
Pain Control with Phototherapy

More than 25 years of LLLT:

Ideal wavelength: 830~850 nm

Multiple applications:
- Sports medicine
- Musculoskeletal pain
- Neurogenic pain
- Postoperative pain

AIMS

Pain attenuation
Return to pre-injury level (muscle tone)
Speedy return to participation

Application

Hands-off irradiation
Whole area treatment (vs laser therapy)

**Application**

- Hands-off irradiation
- Whole area treatment (vs laser therapy)

**RESULTS**

- Pain attenuation: Excellent in 17
  Good in 4
  Fair in 5
  Little or no effect in 2

- Return to pre-injury level (muscle tone)
- Speedy return to participation & training
WOUND HEALING SYMPTOMS PRESENT AFTER BREAST SURGERY
As a percentage (Slide courtesy of Dr Mario Trelles)

12% Healing speed in days
7% Bruising
830/633 nm LED Phototherapy

Source: 12 patients, 6 months follow-up
Pain Control with Phototherapy

• Noninvasive
• Painless
• Side-effect free
• Safe and effective
• Easy to apply
• Well-tolerated