

# NEAR INFRARED LED THERAPY

in the

# MANAGEMENT of

# PAIN

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and Japan Phototherapy Laboratory, Tokyo, Japan**

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U #J ohg #F doghukhdg

WHY

LIGHT-EMITTING

DIODES (LEDs)?

# Phototherapy Light Sources

## Flashlamp Technology (IPL).

\$\$\$\$\$\$\$\$ ; ; ; Wide waveband ; ; Medium area 7

## NSR Laser systems

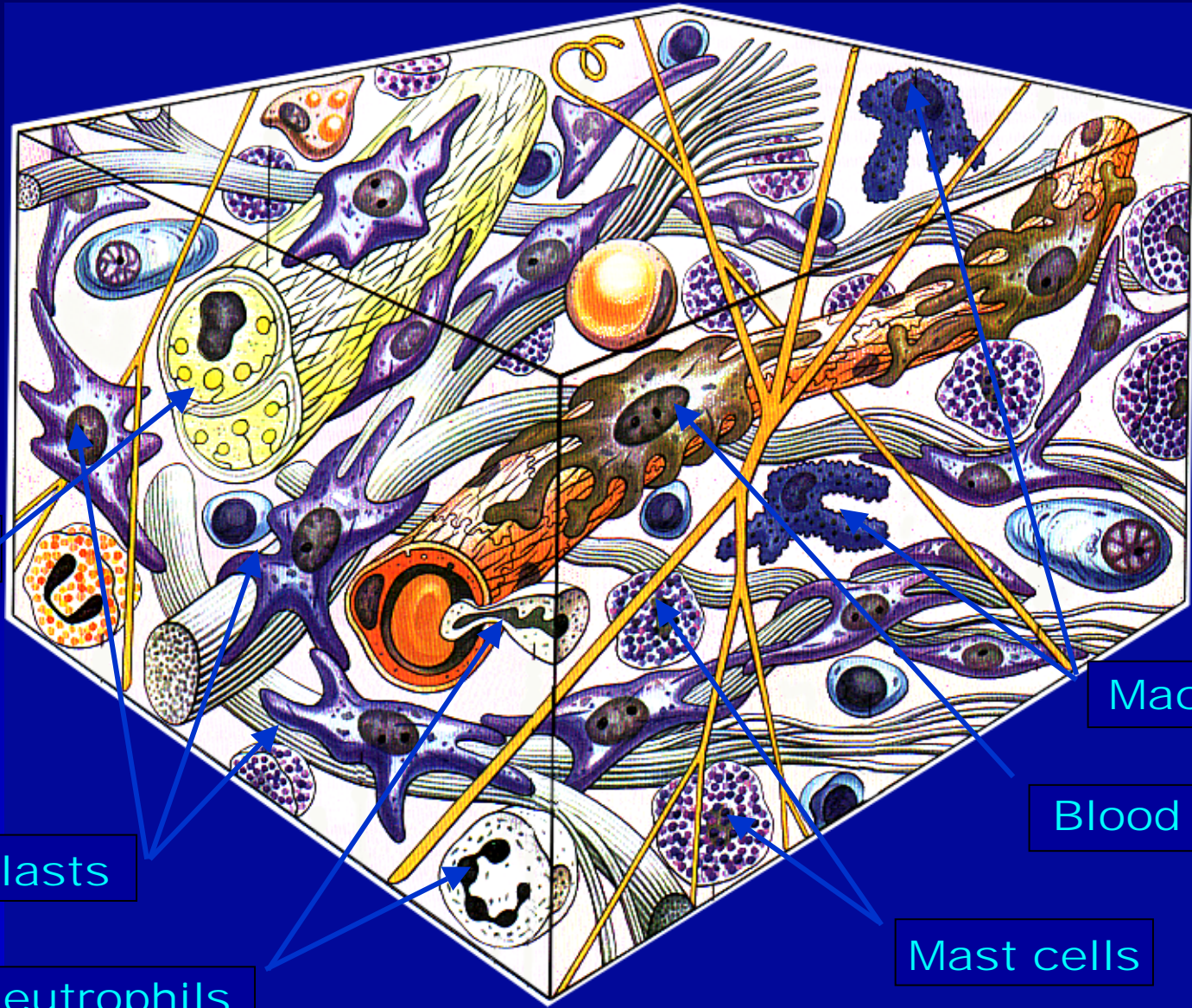
\$\$\$\$\$\$\$\$ ; ; Single wavelength 7 7 7 Small area ;

## Laser Diodes (Laser therapy systems)

\$\$\$ 7 Single wavelength 7 7 7 Small area ;

## Light-emitting Diodes (LEDs, SLEDs)

\$ 7 7 7 7 Very narrow waveband 7 7 Large area 7 7 7 7



NERVES

Fibroblasts

Neutrophils

Macrophages

Blood vessel

Mast cells

# The FIRST LAW of PHOTOBIOLOGY

NO ABSORPTION ...

..... NO REACTION

What is the prime determinant of

Target selection (chromophore?)

Depth of penetration?



# VISIBLE

# INFRARED

GREEN

YELLOW

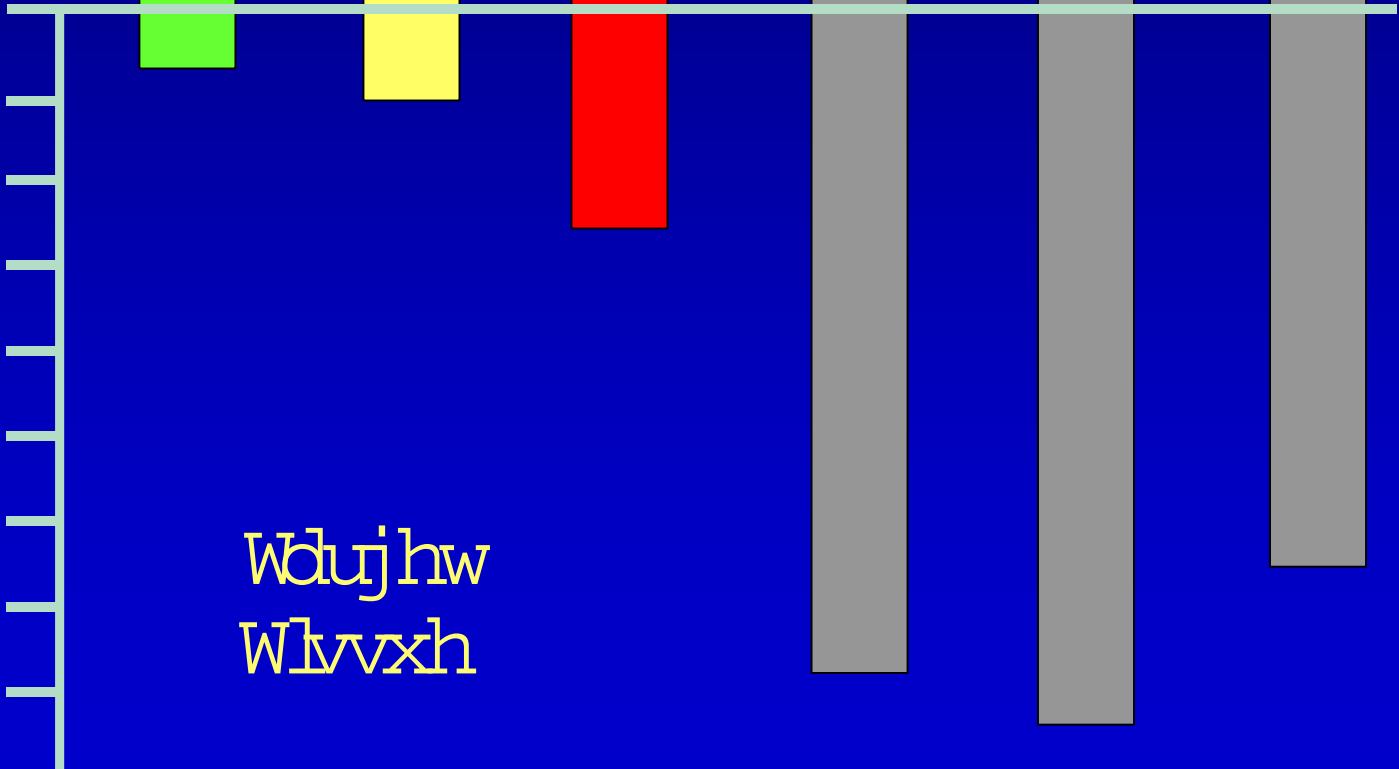
RED

780 nm

850 nm

904 nm

U h o l w y n # \$ h q j h w d w t r q

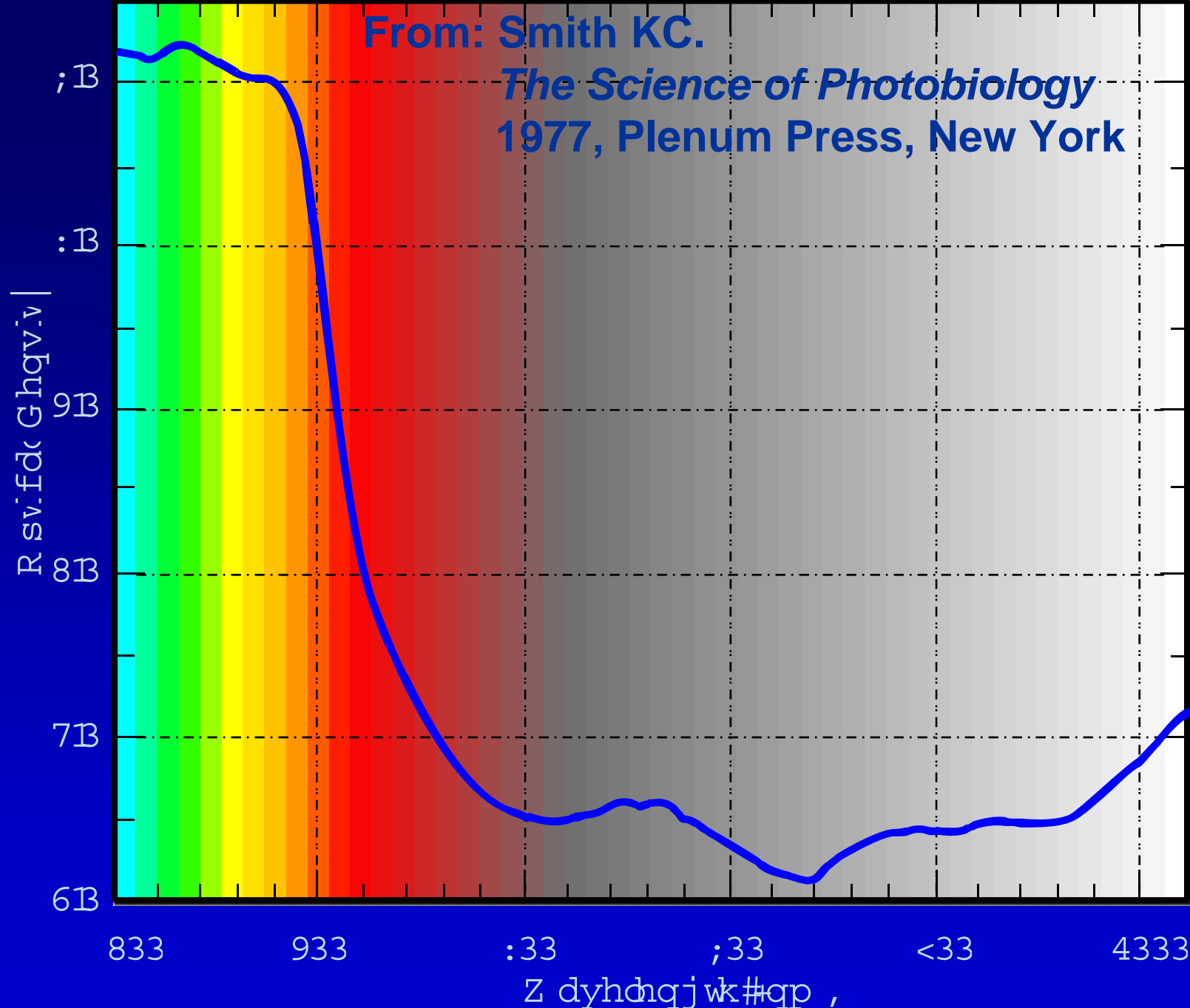


W d u j h w  
W l v v x h

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From: Smith KC.  
*The Science of Photobiology*  
1977, Plenum Press, New York



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Choose the optimal

WAVELENGTH

To reach and involve the

TARGET

# PHOTOTHERAPEUTIC WAVELENGTH-SPECIFIC ACTIONS IN RAISING ACTION POTENTIALS OF SPECIFIC CELLS

Qrp lqdo  
Z dyhdnqjwk  
+qp ,

## Cell Types/Action Level

Mast Neutrophil Macrophage Fibroblast Fibro-Myo Keratinocyte

963E 9:3	++	+	++	+++	+	+++
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:<3	++	B	B	++	B	B
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;63E ;83	+++	+++	+++	+	+++	+++
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<37	-	B	±	-	-	B
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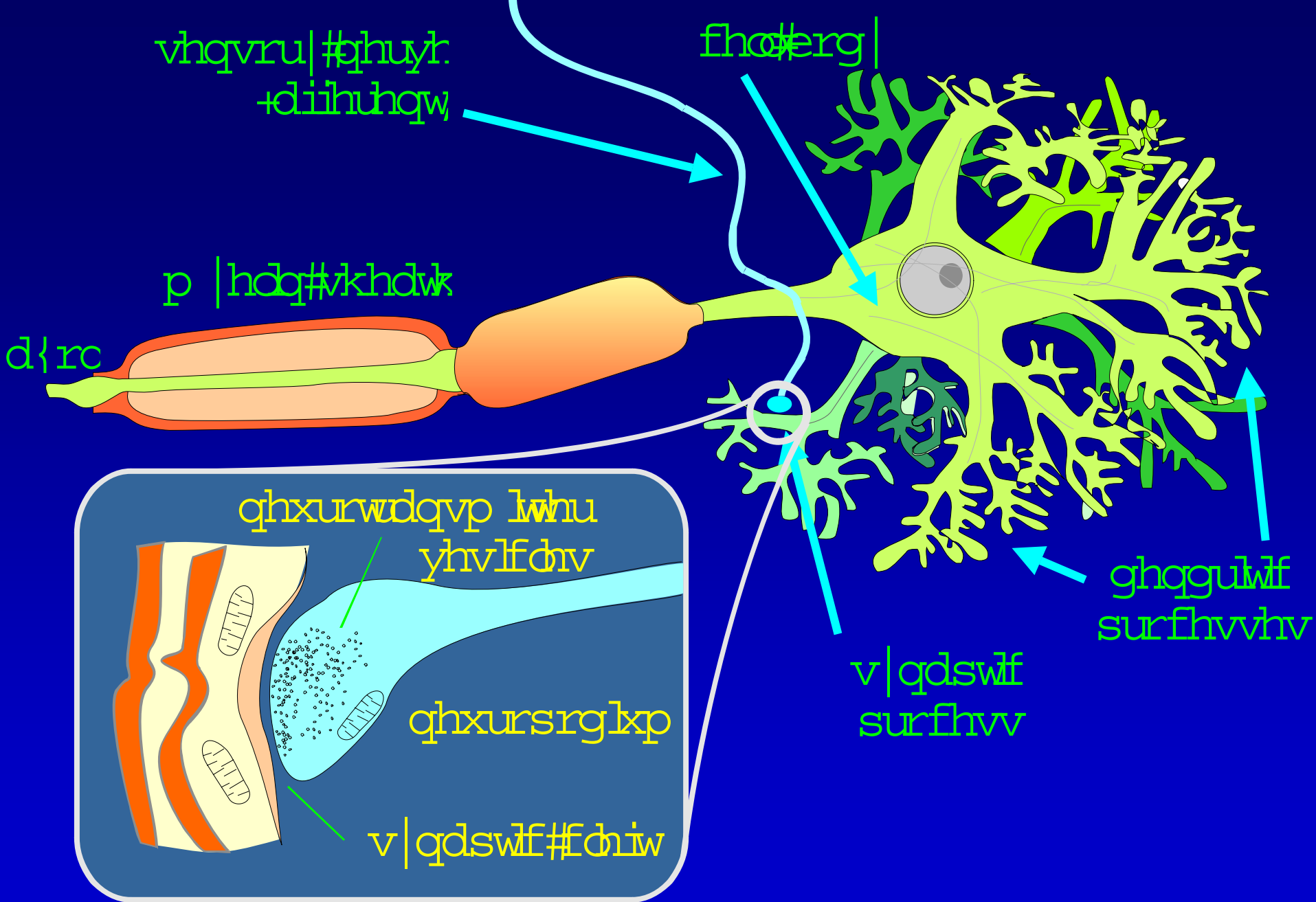
4#97	B	B	B	+	B	B
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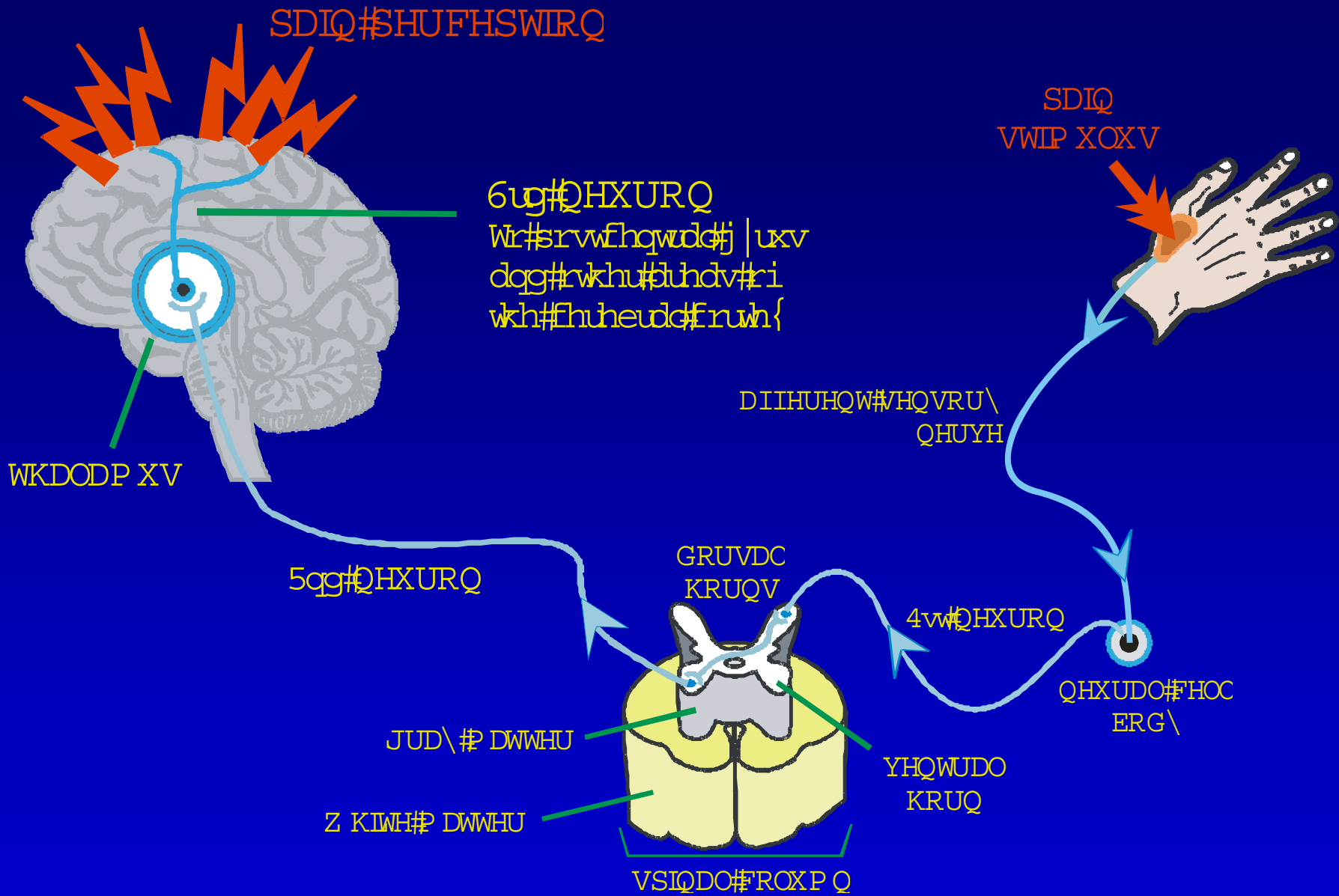
43#33	B	B	B	+	B	B
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RAIN

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# Pain Control with Phototherapy

## Endorphin synthesis (Endogenous Morphine)

*Narcotic autoanalgesia*

Laakso EL, Cramond T, Richardson C, and Galligan JP (1994):

Plasma ACTH and  $\beta$ -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)**

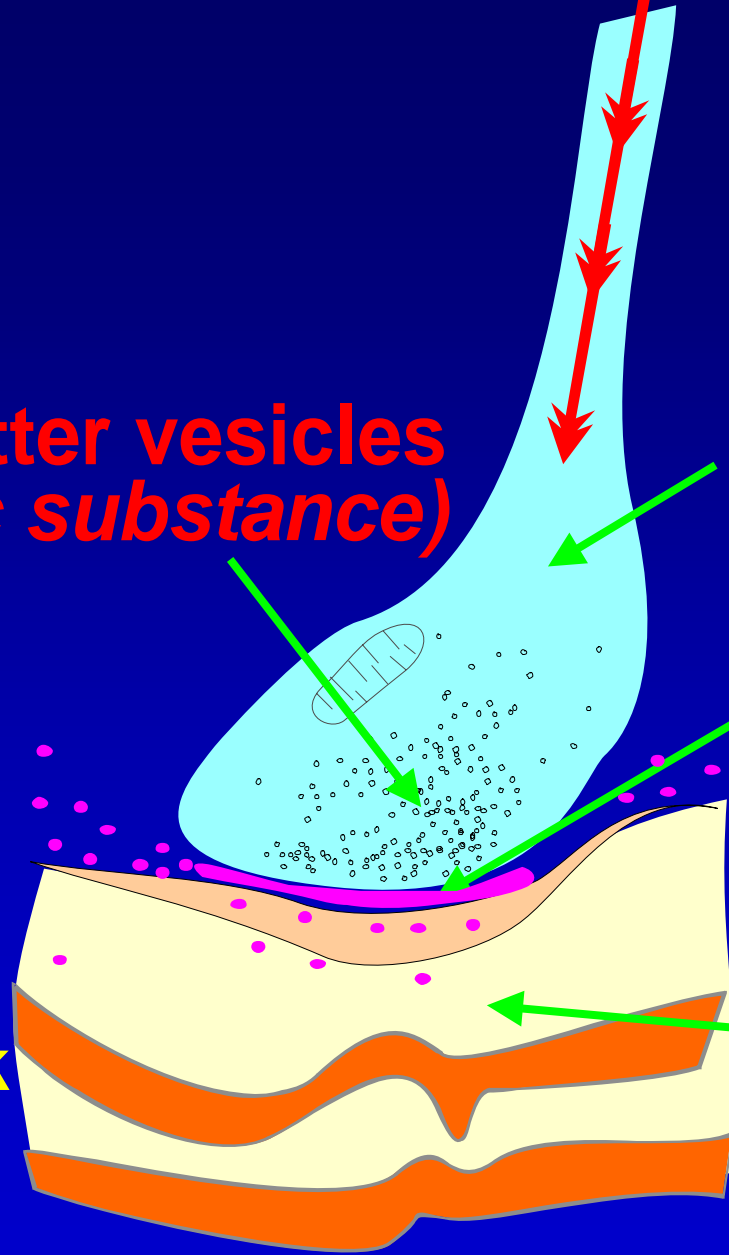
**neurotransmitter vesicles  
(algeassic substance)**

**neuropodium**

**synaptic cleft**

**enkephalins of  
muscular and  
neural origin  
build up in and  
physically block  
synaptic cleft**

**receptor**



# 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

Baxter DG, Bleakley C, Glasgow P and Calderhead RG (2005):  
A NEAR-INFRARED LED-BASED REHABILITATION  
SYSTEM: INITIAL CLINICAL EXPERIENCE  
*Laser Therapy*, 14: 29-36.

## AIMS

Pain attenuation

Return to pre-injury level (muscle tone)

Speedy return to participation

## Application

Hands-off irradiation

Whole area treatment (vs laser therapy)

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## Application

Hands-off irradiation

Whole area treatment (vs laser therapy)

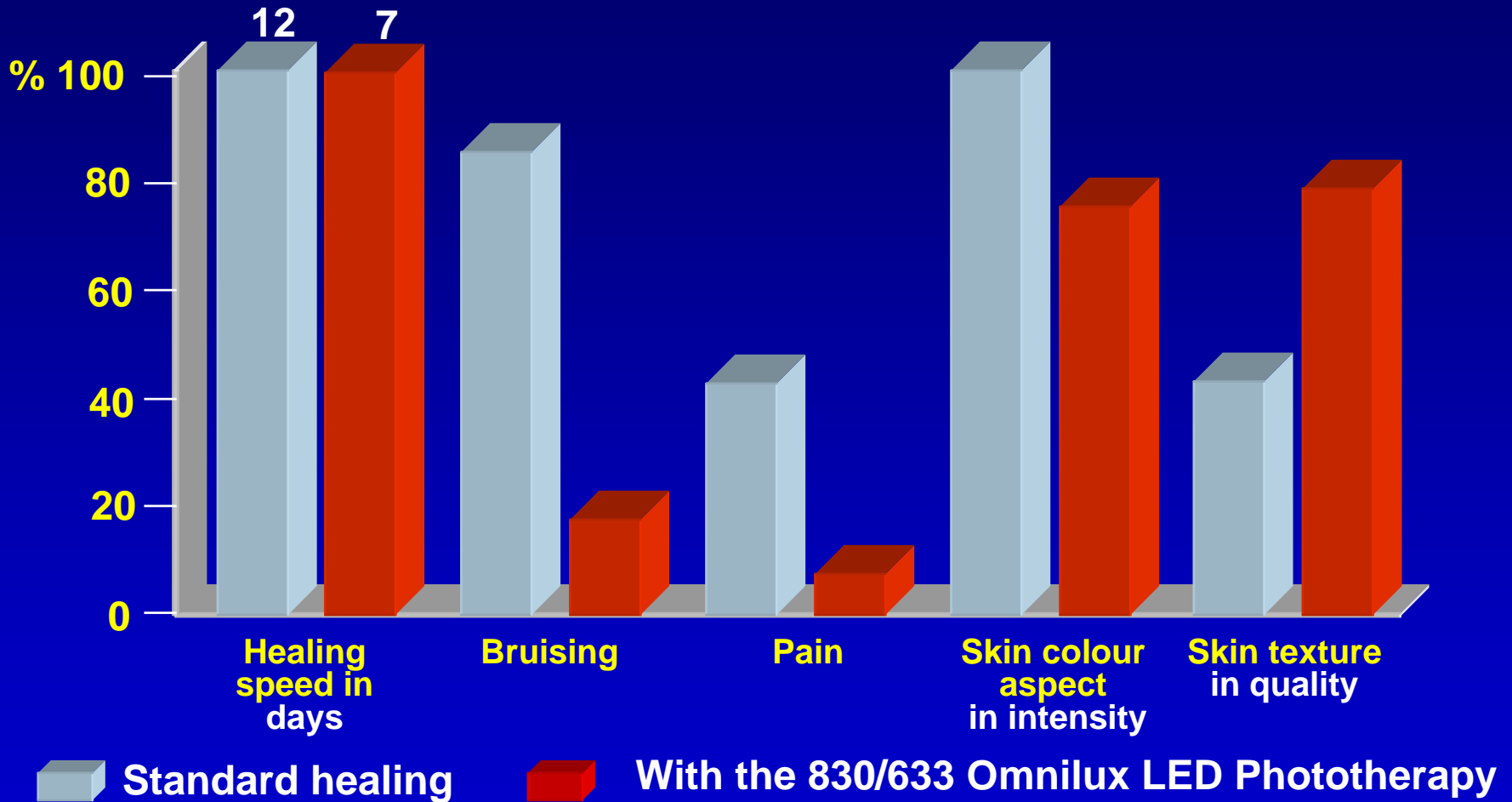
## RESULTS

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)



Source: 12 patients, 6 months follow-up

# Pain Control with Phototherapy

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