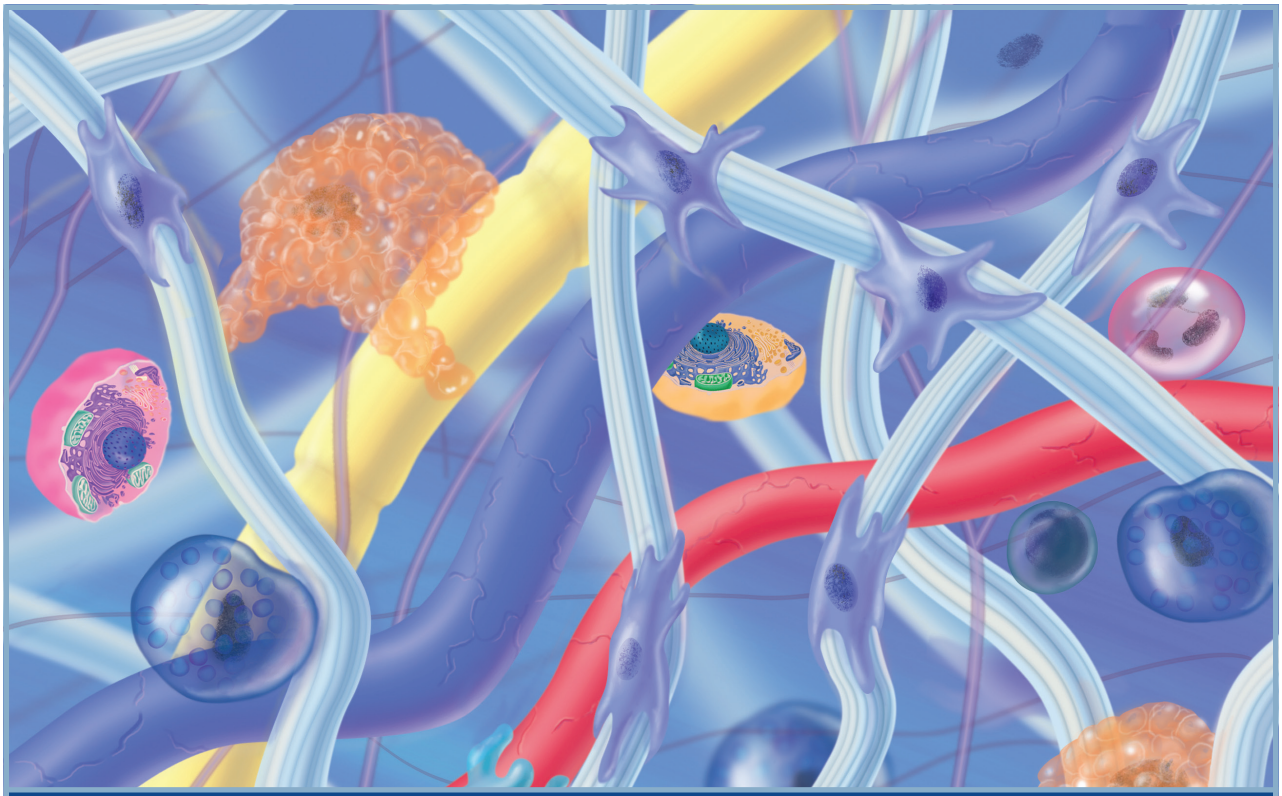
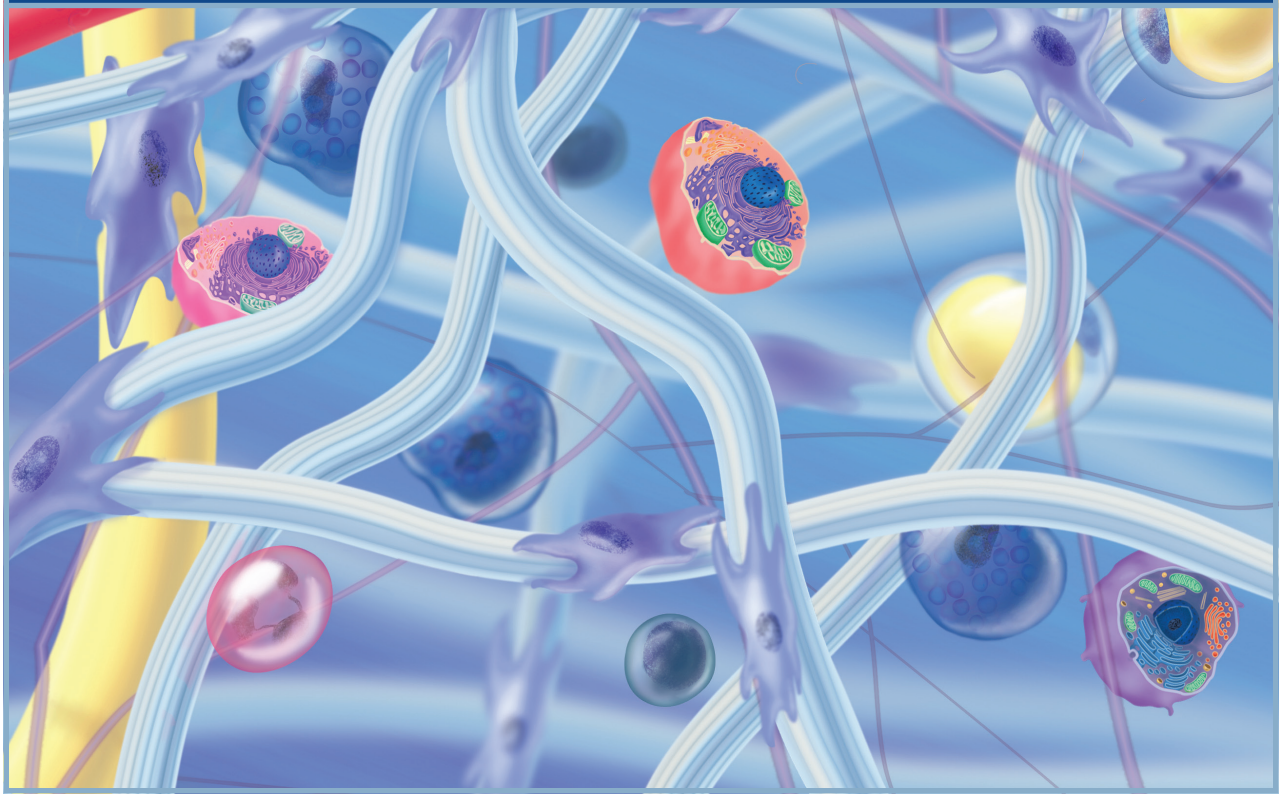


# FROM BASIC SCIENCE
to
# ADVANCED TECHNOLOGY



# CONTENTS

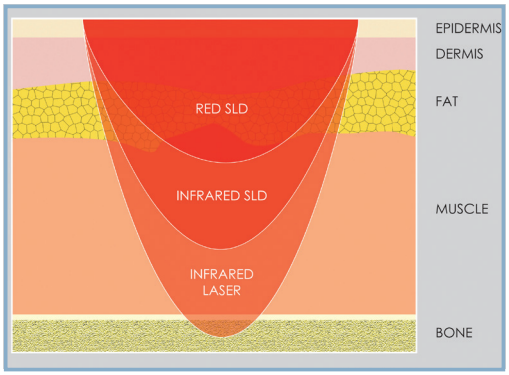
# INTRODUCTION TO LASER THERAPY

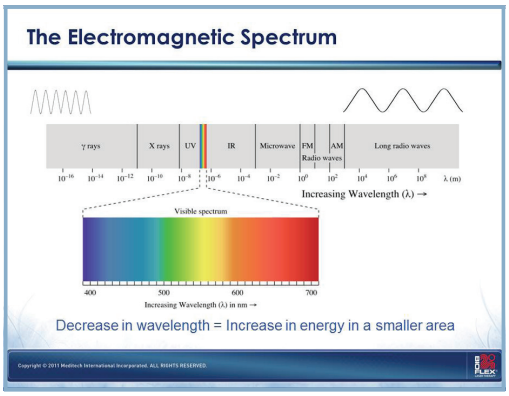
## WHAT IS LASER THERAPY

The technology utilizes superluminous and laser diodes to irradiate diseased or traumatized tissue with photons. These particles of energy are selectively absorbed by the cell membrane and intracellular molecules, resulting in the initiation of a cascade of complex physiological reactions, leading to the restoration of normal cell structure and function.

The process is curative and therefore results in the elimination of symptoms including pain. In addition, it enhances the body's immune system response and facilitates natural healing.

Compared to traditional treatment, patients recover from musculoskeletal and peripheral nerve injuries with less scar tissue, accelerated cell regeneration and improved function.



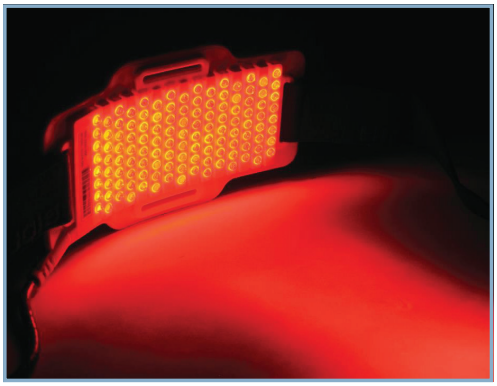




## ADVANTAGES OF LASER THERAPY

- Non-invasive
- Non-toxic
- Easily applied
- Highly effective
- No adverse effects

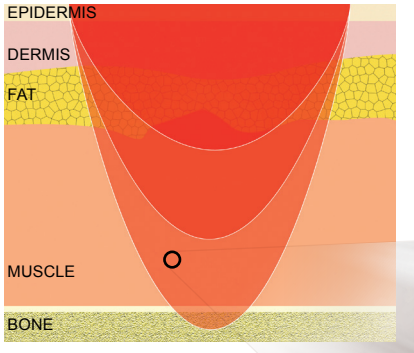
The technology is highly effective in the treatment of musculoskeletal conditions, arthritis, sports injuries, wound healing and a wide range of dermatological conditions.

Studies are ongoing with regard to a number of additional challenging medical problems.

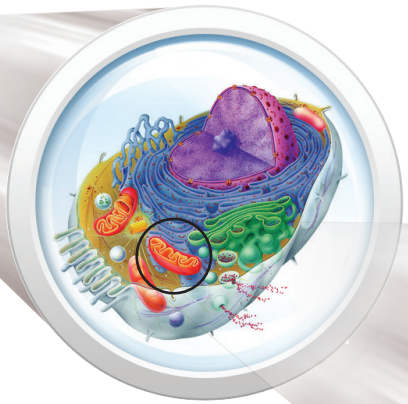


Photon particles of red and infrared light (600 – 900 nm) penetrate 5-10 cm deep into tissue and are absorbed by the mitochondria inside of cells

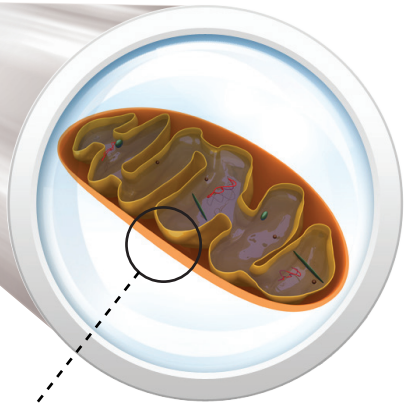
## TISSUE PENETRATION



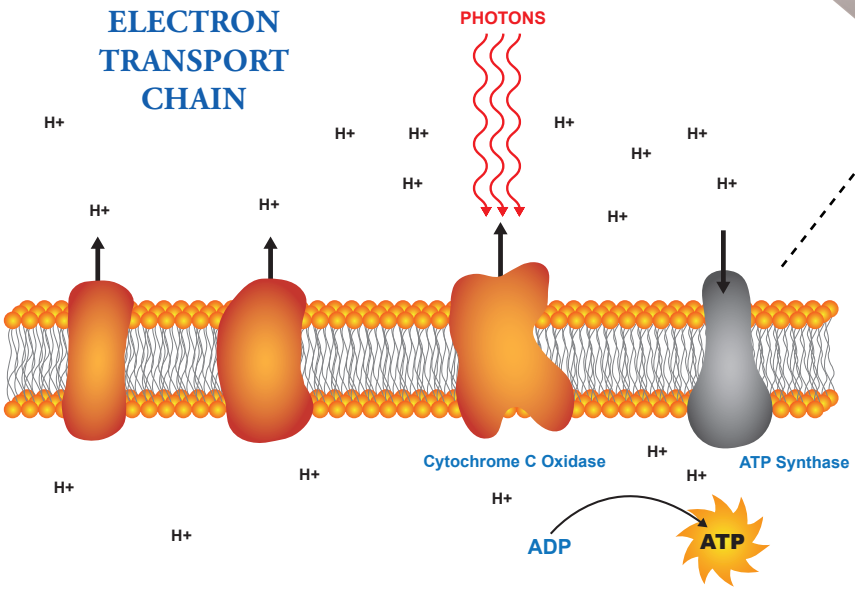

## EUKARYOTE CELL



## MITOCHONDRIA



## ELECTRON TRANSPORT CHAIN



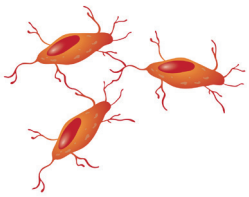

Cytochrome C Oxidase in damaged tissue absorbs these photons leading to increased ATP production


ATP plays a role in energy metabolism and intracellular signaling

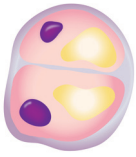
**CELL PROLIFERATION**

**FIBROBLASTS**

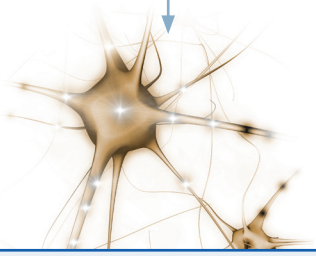
**OSTEOCYTES**



**CHONDROCYTES**



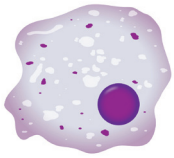
↑ Collagen, Cartilage and Bone Regeneration



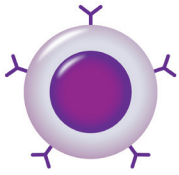
Tissue and Nerve Regeneration

**INFLAMMATORY MEDIATORS**

**MACROPHAGES**



**LYMPHOCYTES**



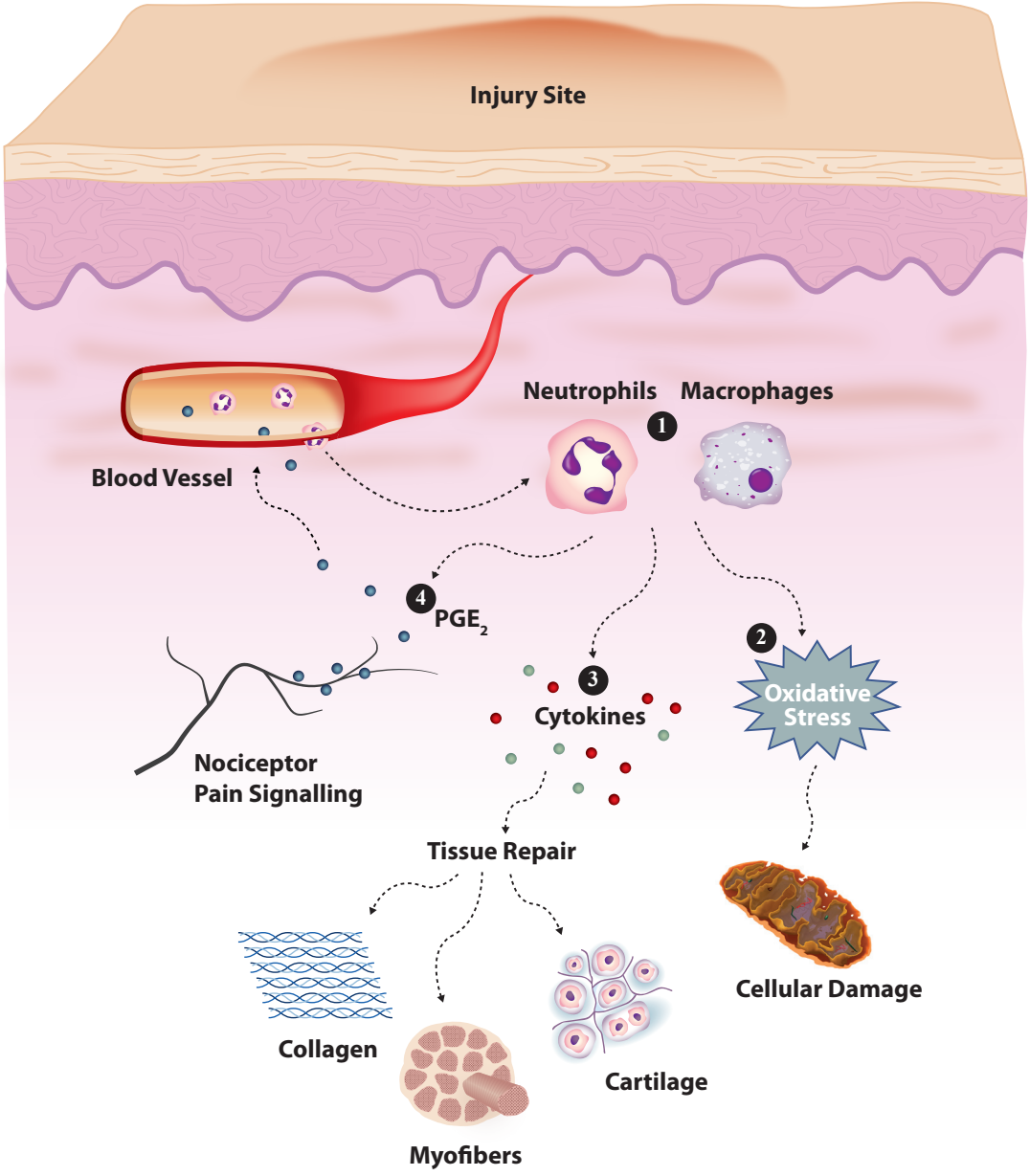
**NEUTROPHILS**

↓ Inflammation and Edema

Resolution of Inflammation and Pain

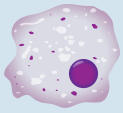
## Inflammation Pathway

Inflammation is a local response to cellular injury that is marked by capillary dilatation, leukocytic infiltration, erythema, edema, pain and often loss of function. It also serves as a mechanism to initiate tissue repair and eliminate damaged tissue.



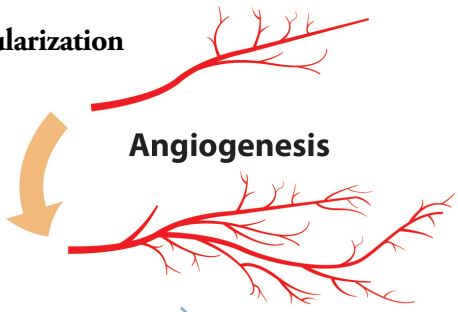
## Laser Therapy Effects on the Inflammation Pathway

Laser Therapy's modulation of inflammatory mediators allows for an accelerated resolution of the inflammatory process and enhanced tissue repair.

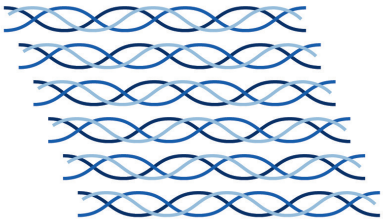
| | Target Cells | Clinical Effects |
|---|---|---|
| 1 | ↑ Macrophages  | Removes foreign bodies and damaged cells in preparation for the tissue repair process |
| | ↓ Neutrophils  | Limits the production of pro-inflammatory cytokines which breaks the cycle of chronic inflammation |
| 2 | ↓ Oxidative Stress   | Promotes cell survival and reduces damage to cellular membranes, thereby promoting tissue repair |
| 3 | ↑ Anti-inflammatory Cytokines  | Stimulates tissue repair including collagen, myofibers and cartilage |
| | ↓ Pro-inflammatory Cytokines  | Prevents stalling in the inflammatory phase which can lead to chronic inflammation |
| 4 | ↓ Prostaglandin ($PGE_2$) levels  | Decreases sensitivity to pain preventing hyperalgesia common in chronic inflammatory conditions<br>Decreases vasodilation thereby reducing inflammation characterized by edema |

# CLINICAL EFFECTS OF LASER THERAPY

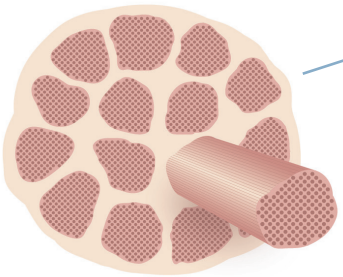
**Angiogenesis & Neovascularization**
An increase in oxygenated blood to the injured tissue accelerates tissue healing.

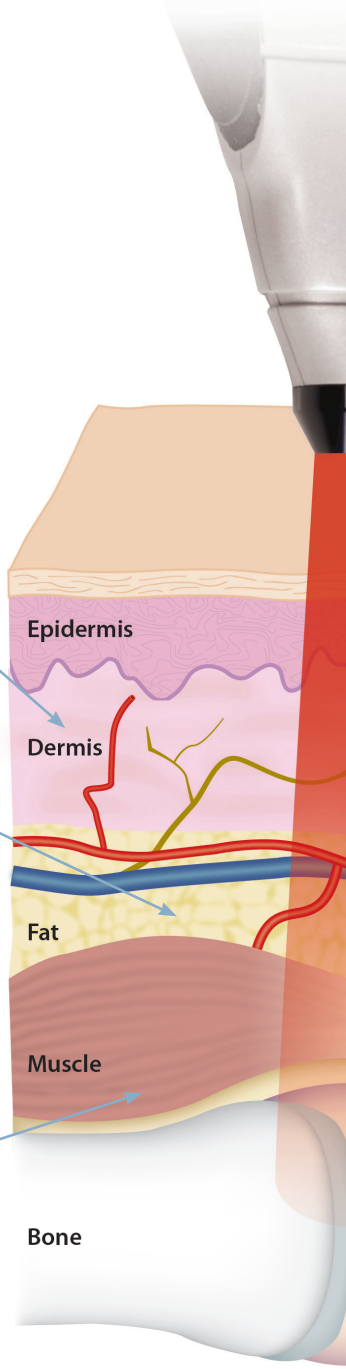


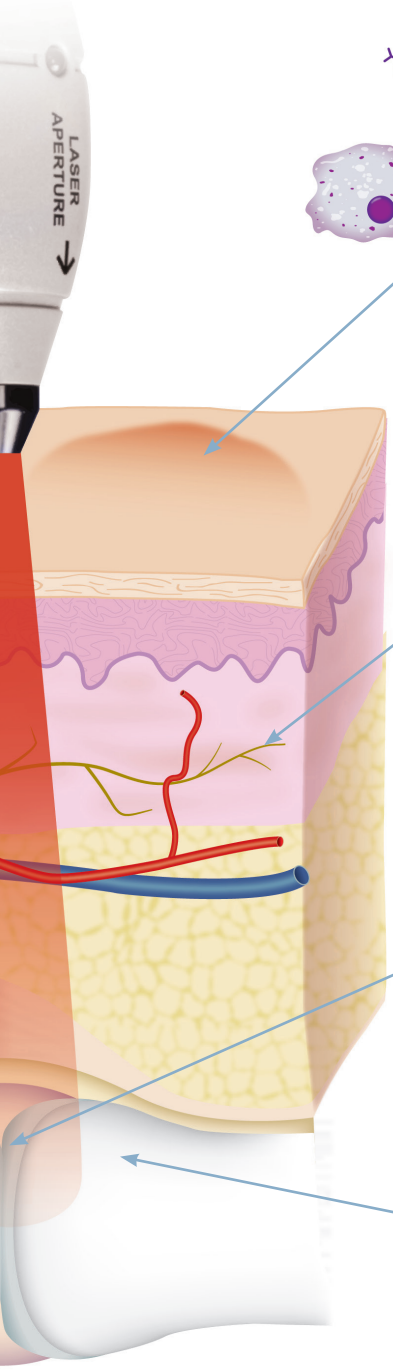

**Collagen Production**
Proper alignment and remodeling of collagen reduces internal scar formation and enhances tissue elasticity.



**Muscle Regeneration & Muscle Atrophy**
Repair of damaged muscle fibers and activation of myogenic satellite cells leads to regeneration of muscle tissue.








**Inflammation & Edema**
Increase in inflammatory mediators such as macrophages, neutrophils and lymphocytes accelerates and resolves the inflammatory process.

**Nerve Regeneration**
Proliferation of growth factors promotes neuronal sprouting and myelin formation for optimal nerve recovery.

**Cartilage Production**
Increase in chondrocyte and collagen production allows for improved cartilage deposition and joint function.

**Bone Formation**
Proliferation of osteocytes and remodeling of bone extracellular matrix results in accelerated bone repair.

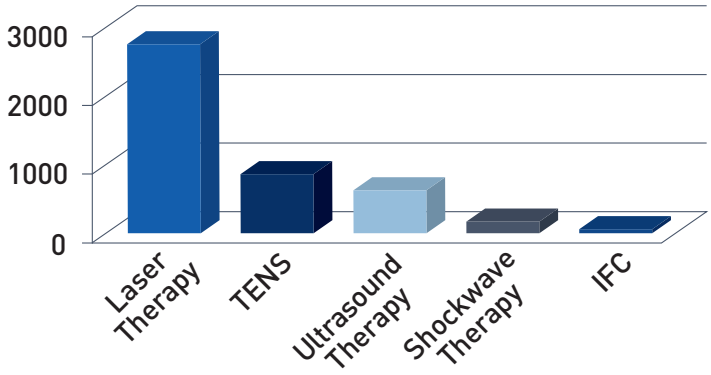
# COMPARISON OF THERAPEUTIC MODALITIES

| Mechanisms of Action | Laser Therapy | TENS | Ultrasound Therapy | Shockwave Therapy | IFC |
|---|---|---|---|---|---|
| Increased ATP Production | ✓ | | | | |
| Inhibition of Nociceptor (Pain) Signaling | ✓ | ✓ | | | ✓ |
| Endorphin Release | ✓ | ✓ | | | ✓ |
| Angiogenesis | ✓ | | | ✓ | |
| Tissue Regeneration | ✓ | | ✓ | | |
| Resolution of Inflammation | ✓ | | ✓ | | |
| Thermal Effect | | | ✓ | | |

| Indications | Laser Therapy | TENS | Ultrasound Therapy | Shockwave Therapy | IFC |
|---|---|---|---|---|---|
| Pain | ✓ | ✓ | ✓ | | ✓ |
| Muscle Tears, Sprains or Spasms | ✓ | | ✓ | | ✓ |
| Tendon Injuries | ✓ | | ✓ | ✓ | |
| Arthritis | ✓ | | ✓ | | ✓ |
| Peripheral Nerve Injuries | ✓ | | ✓ | | |
| Bone Fractures | ✓ | | | ✓ | |
| Microcirculation | ✓ | | | | ✓ |
| Edema and Inflammation | ✓ | | | | |
| Wounds & Dermatological Conditions | ✓ | | | | |

| Contraindications | Laser Therapy | TENS | Ultrasound Therapy | Shockwave Therapy | IFC |
|---|---|---|---|---|---|
| Over Uterus in Pregnancy | X | X | X | X | X |
| Directly over Malignancies | X | X | X | X | X |
| Impaired Skin Sensation | | X | X | X | X |
| Pacemakers | | X | X | | |
| Risk of Hemorrhage or Thrombosis | | | X | X | |
| Bone Fractures | | | X | | |
| Epilepsy | | | | | X |
| Cardiovascular Disease | | | | | X |
| Metal Implants | | | | X | |

## Evidence-Based Research



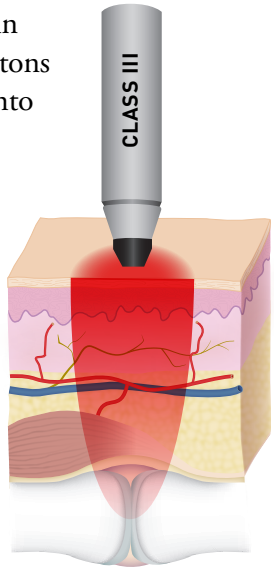

- Indications include commonly used applications of each therapeutic modality
- Evidence-Based Research graph is based on a Pubmed search of the following keywords "LLLT", "transcutaneous electrical nerve stimulation", "ultrasound therapy" OR "therapeutic ultrasound", "shockwave therapy", "interferential current"

# CLASS III VS. CLASS IV LASERS

## Deeper Penetration of Photons

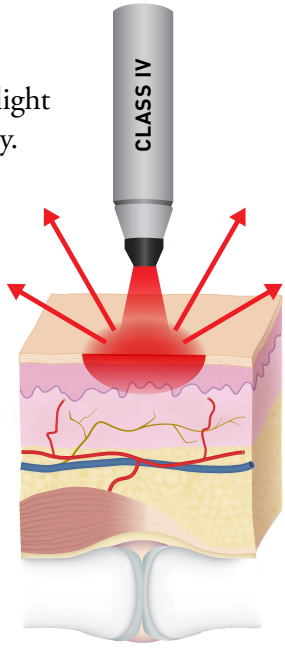
### CLASS III

Contact with skin ensures that photons penetrate deep into the target tissue.

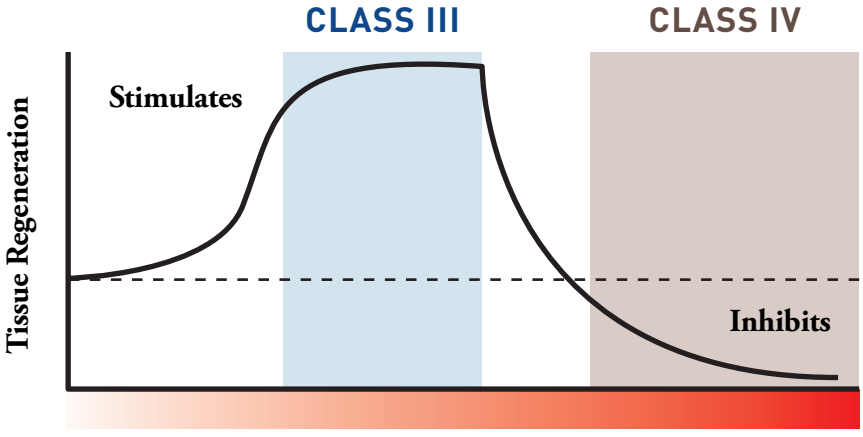



### CLASS IV

Up to 80% of light is reflected away.

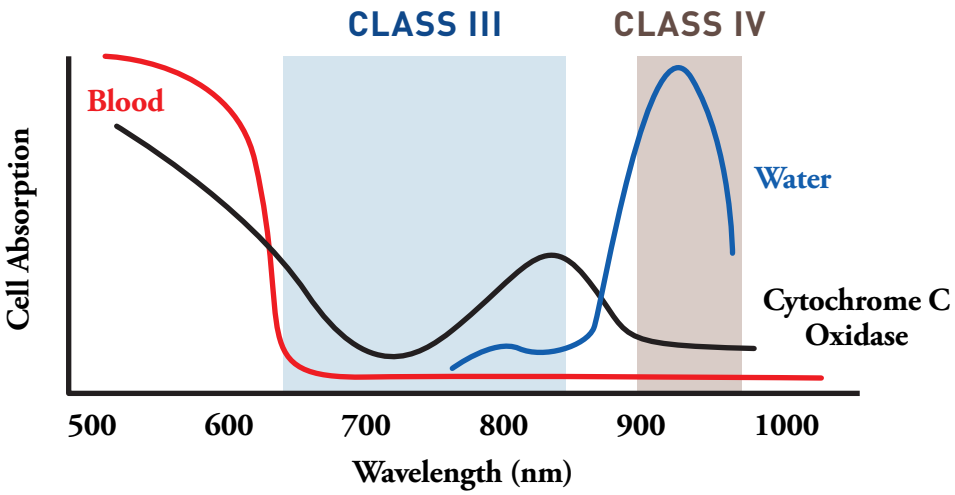



## Optimal Power for Tissue Regeneration



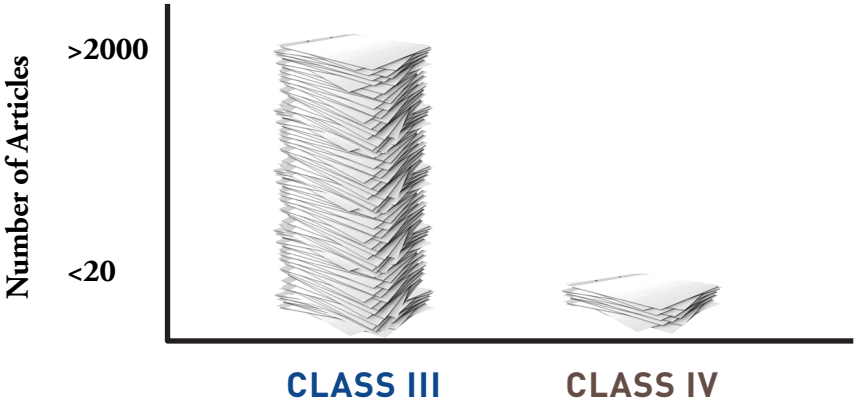

Too little power has no effect and too much power can cause tissue damage through heating (Arndt-Schultz Law)

## Best Wavelengths for ATP Production




Avoiding photon absorption by blood and water ensures maximum ATP production through Cytochrome C Oxidase absorption

## Published Research Articles




Over 50 years of evidence-based peer-reviewed research supporting Class III lasers

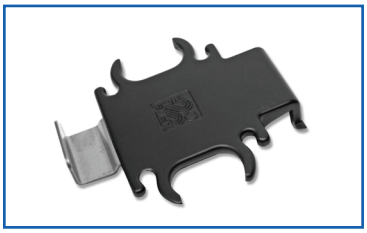
**CLASS III LASERS ARE SAFE & EFFECTIVE WITH PROVEN CLINICAL RESULTS**

# THE BIOFLEX ADVANTAGE

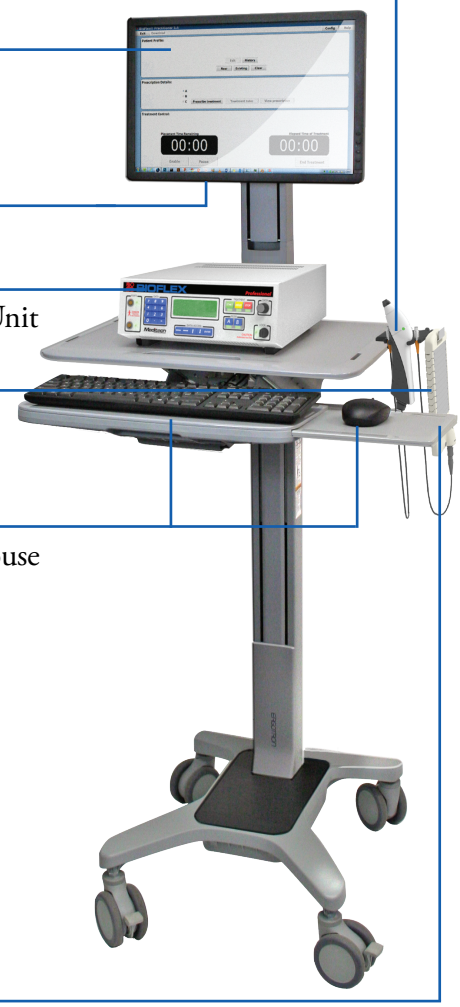
**The BioFlex Professional Laser Therapy System offers clinicians the highest clinical success rates with predictable, reliable and reproducible results.**

Infrared Laser Probe

Treatment Array



Custom Designed Ergonomic Cart w/ Treatment Array/ Probe Holder




BIOFLEX® LASER THERAPY

**www.bioflexlaser.com**

## Large Flexible Arrays

- Contours to anatomical configuration permitting accurate and reliable dosage delivery
- Allows for hands-free treatment
- Covers a large area of tissue 11.6 $in^2$ (75 $cm^2$)
- 179 superluminous diodes per array (750 – 1500 mW)

## Laser Probe

- LD-I 200 Class 3B Laser (200 mW)
- LD-R 100 Class 3B Laser (100 mW)

## 3 Different Wavelengths

- Heals tissue at an optimum rate – 660 nm, 830 nm and 840 nm (peaks of cytochrome C oxidase absorption)

## Software

- Scientifically researched and clinically developed over 30 treatment protocols for a wide range of medical conditions
- Capacity to deliver an infinite range of protocols through the customization of parameters including frequency, duty cycle, waveform, energy density and duration
- Menu-Driven “Info” and “Help” buttons – offer information and clinical advice for protocol applications
- Software can be updated based on new clinical findings and research

## Anatomical and Pathology Tutor

- Provides detailed illustrations of pathologies and anatomy for therapist
- Educates patients thereby improving patient compliance

## Portable and Stationary Mode

- All BioFlex Systems are portable and can be used in stand-alone configuration

## Patient Factors

- Treatment protocols modified according to variables such as age, skin colour and body type ensuring predictable and effective treatments

## Electronic Patient Software

- Permanent database includes patient info, history, diagnosis and prescribed treatments

# BIOFLEX LASER THERAPY

**CLINICALLY PROVEN • HIGHLY EFFECTIVE**

www.bioflexlaser.com

- Accelerates Healing
- Anti-inflammatory
- Eliminates Pain

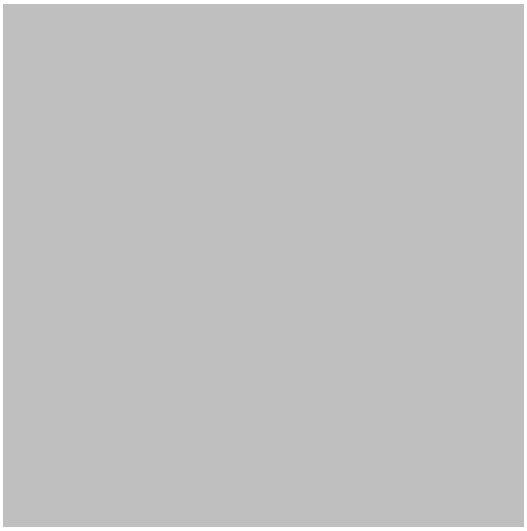
## CONDITIONS TREATED

**Soft Tissue & Sports Injuries (Trauma)**
Tendonitis, Muscle/Ligament Tears,
Lacerations, Contusions, Hematoma

**Arthritic Conditions**
Degenerative Osteoarthritis, Chronic Back Problems, Sciatica,
Spinal Stenosis,

**Repetitive Motion Injuries**
Carpal Tunnel Syndrome, Rotator Cuff Injuries, Epicondylitis,
Plantar Fasciitis,
Achilles Tendonitis

**General Problems**
Disc Herniation, Fibromyalgia, Post Herpetic Neuralgia,
Reflex Sympathetic Dystrophy, Diabetic Neuropathy



Insert Clinic Information Here

Health Canada
Medical Device License

FDA Cleared

## HOW CAN I GET STARTED WITH LASER THERAPY?

- Clinic Visit
- Webinar
- Training