# Understanding Photobiomodulation

The Science Behind How MLS Laser Therapy Works

Photobiomodulation

LASER IS LIGHT

LIGHT IS ENERGY

ENERGY INTERACTS WITH TISSUE INDUCING BIOLOGICAL EFFECTS

Analgesic Effect Anti-inflammatory Effect Biostimulating Effect

#### Primary and Secondary Effects of Laser

#### **Primary Effects**

**Photothermal** 

**Photochemical** 

**Photomechanical** 

#### **Secondary Effects**

Cellular

Tissue

Systemic

### **Photothermal Primary Effects**



Conversion from laser wavelengths into thermal energy

Increase in circulation

speed of catabolite removal

Increase
supply and
devlivery of
oxygen and
nutrients

# **Photochemical Primary Effects**



Law of Photochemistry:

Light must be absorbed by a chemical substance in order for reaction to take place.

In the body, that's respiratory enzyme cytochrome c oxidase (involved in electron transport chain in mitochondria)

Laser also absorbed
by chromophores
(melanin,
hemoglobin, water,
proteins, etc)

Modulation of cellular metabolism: Na-K pump

Enzymatic
activation and
changes in pain
perception
threshold

Increase in ATP production

# **Photomechanical Primary Effects**



Production of Extracellular matrix (tissue repair and regneration)

Maintenance of homeostatis of tissue

Re-absorption of edema

Reactivation of microcirculation

#### **Secondary Effects**

#### Effects on cells

Effects on tissue

**Increases ATP synthesis** 

Increases Myo-B a-enolase, regulating and mediating reconstruction of damaged muscle fibers

Increases Extracellular matrix and encourages remodeling

Increases NLRP-10 (antiinflammatory protein Increases PP1 protein and alkaline phosphate activity

Increases actin and tropomyosin

Increases Galectin a-3 and HNRNP K proteins (induces angiogenesis and regenerates nerve fibers)

Reduced edema reabsorption times

Prevents formation of scare tissue

# **Systemic Secondary Effects**

**Analgesic effect** 

Anti-inflammatory effects

Bio stimulation

Blocks pain stimulus conduction

Washes out allogenic substances like histamine

Increases endorphin synthesis

Modulates pain stimulus

Induces vasodilation

Encourages permeability of lymphatic capillary vessels

Washes out and inhibits pro-inflammatory molecules

Increases nutrients, oxygen, and growth factors

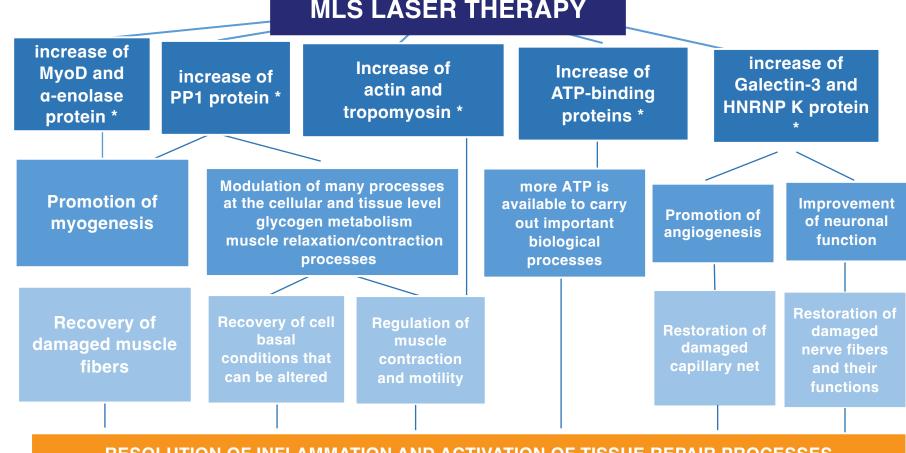
Activates cell functions (metabolism)

Induction and recovery of muscle fibers

Induction and recovery of nerve endings

Reduces scar tissue formation

#### Metabolic: Functional and reparative effects **MLS LASER THERAPY**



RESOLUTION OF INFLAMMATION AND ACTIVATION OF TISSUE REPAIR PROCESSES