

Physiological Effects of Low Intensity Light Therapy

What is Light Therapy?

Light therapy is the use of monochromatic light emission from a low intensity laser diode (200 milliwatts or less) or an array of high intensity Super Luminous Diodes (providing total optical power in the 1000-2000 milliwatt range) to treat musculoskeletal injuries, chronic and degenerative conditions and to heal wounds. The light source is placed in contact with the skin allowing the photon energy to penetrate tissue, where it interacts with various intracellular biomolecules resulting in the restoration of normal cell function and enhancement of the body's healing processes. The specific effects and conditions treated by Low Intensity Laser Therapy are presented below.

SHORT TERM EFFECTS

- Production and release of beta-endorphins (these are morphine like substances produced by various cells in the body that inhibit the sensation of pain)
- Cortisol production is increased (cortisol is the precursor of cortisone). This enables the body to combat the stress associated with trauma or the disease process
- The short-term effect is significant in 5-10% of cases during or after the conclusion of the initial treatment, but is not as important as the long term or cumulative effect

LONG TERM OR CUMULATIVE EFFECT

- ATP (adenosine triphosphate) production is increased resulting in improved cellular metabolism
- DNA (desoxyribosenucleicacid) production, the protein building block of tissue is substantially increased
- Neurotransmission is facilitated due to elevated levels of serotonin and acetylcholine
- Mitochondrial activity is stimulated resulting in cell replication etc.
- Modulation of macrophages, fibroblasts and other cells
- Angiogenesis (formation of new blood vessels)
- Regulates cell membrane potential, essential in NA, CL and K ion transfer (electrolyte balance)
- Cytokines and other chemicals enhancing cellular communications are released

OTHER EFFECTS

- The immune response is stimulated
 - Lymphatic drainage is improved
 - The histamine response is positively altered
 - Production of growth hormone is increased
 - Stimulation of the healing processes is accompanied by relief of symptoms
- It should be noted that many other positive physiological activities are modulated and extensive research is currently in progress to fully explore these changes.

SUMMARY

Absorption as a result of photon bombardment of various bio-molecules in the cell results in the transformation of light into biochemical energy. This is a cumulative effect and requires sufficient stimulation in order to initiate response. Typically 5-20 treatments varying from 20 - 60 minutes in duration are required. The end result of low intensity laser irradiation is the restoration of normal function of the cell unit. Worldwide research to date has failed to record any negative effects from this process. It should be noted that normally functioning cells are not adversely affected by the irradiation. In contrast to other therapies, Low Intensity Laser Therapy is curative rather than simply modulating symptomatology.

Applications

The potential for medical application of low intensity lasers exists in a great number of medical fields. The musculoskeletal problems most effectively treated are:

(i) General

- repetitive stress injury
- carpal tunnel syndrome
- rotator cuff tear
- fibromyalgia
- reflex sympathetic dystrophy
- temporomandibular joint problems (TMJ)

(ii) Injuries

- ligament and tendon tears
- fractures with associated soft tissue injuries
- facet syndrome
- contusions
- bulging and herniated discs

(iii) Inflammatory

- tendonitis
- myositis
- synovitis
- bursitis
- plantar fasciitis
- rheumatoid arthritis

(iv) Degenerative

- osteoarthritis
- chondromalacia patella
- discogenic and vertebrogenic radiculopathy
- calcifications (e.g. bone spurs)

(v) Other Applications

- wound healing
- dermal ulcers: 1. venous stasis
2. atherosclerotic
3. contact
4. diabetic
- burns: 1. thermal
2. chemical
- lymphedema
- dermatology: 1. shingles
2. dermatitis
3. psoriasis
- gout
- sinusitis